United States Department of Agriculture

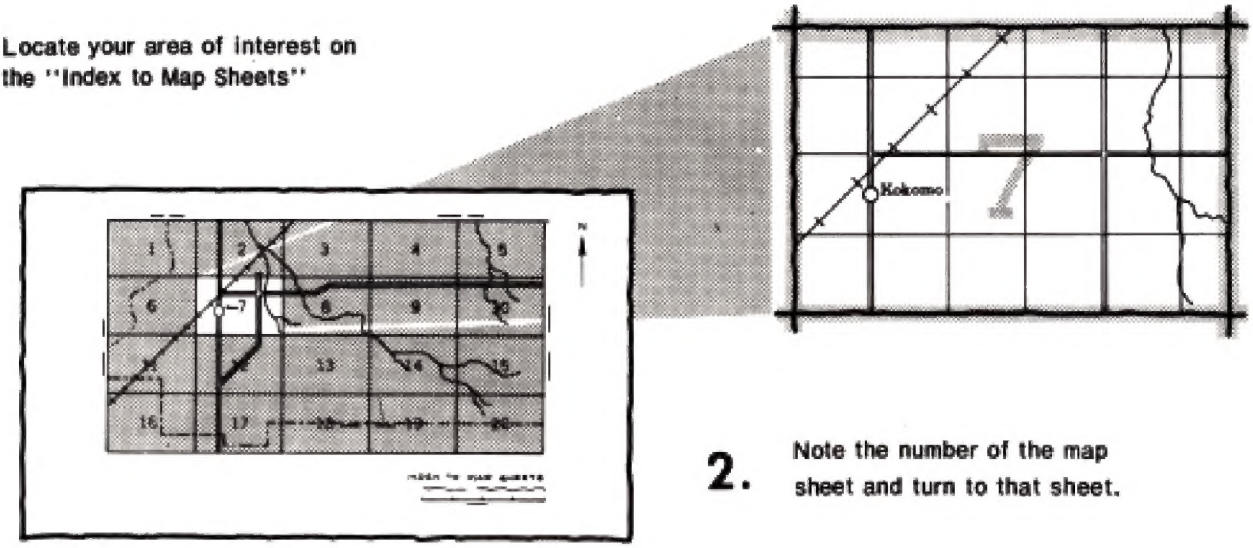
Soil Conservation Service

In Cooperation with Pennsylvania State University, College of Agriculture, and Pennsylvania Department of Environmental Resources State Conservation Commission

Soil Survey of Bradford and Sullivan Counties, Pennsylvania

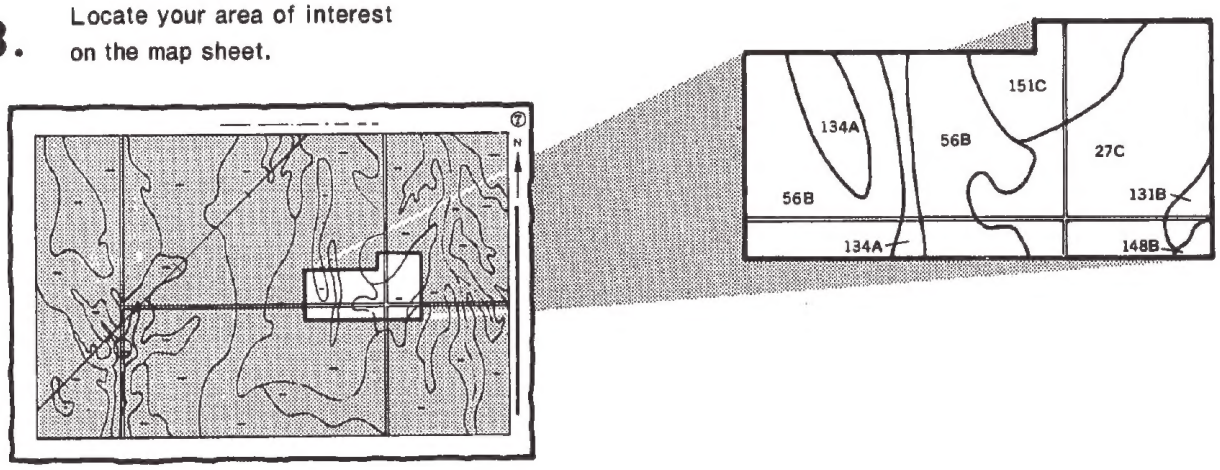
HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"

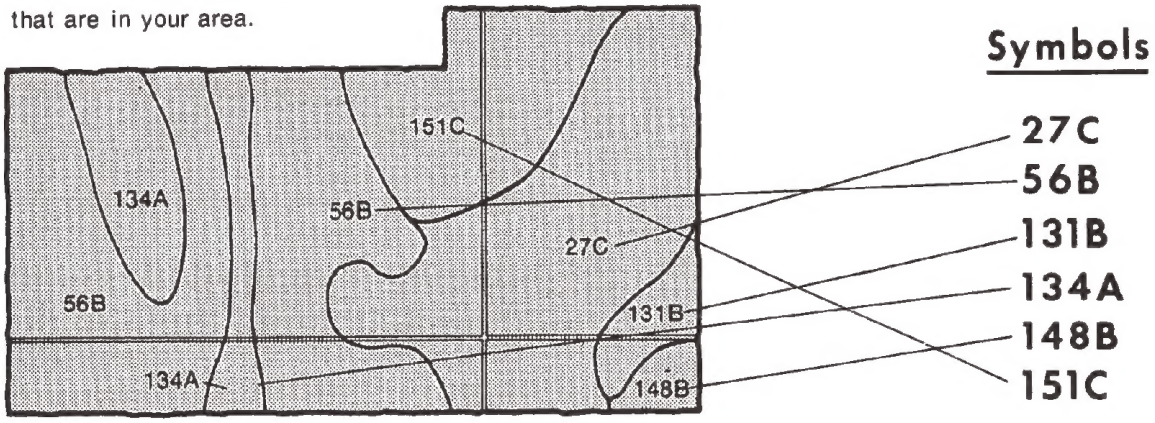


2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.

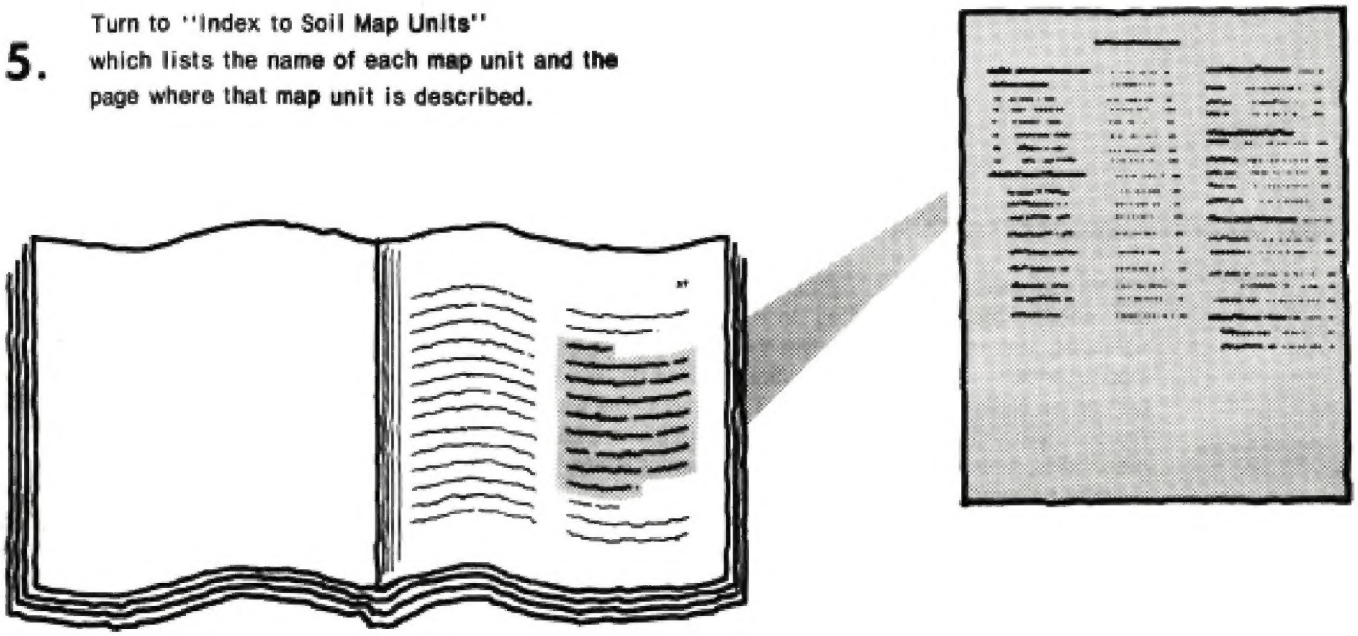


4. List the map unit symbols that are in your area.

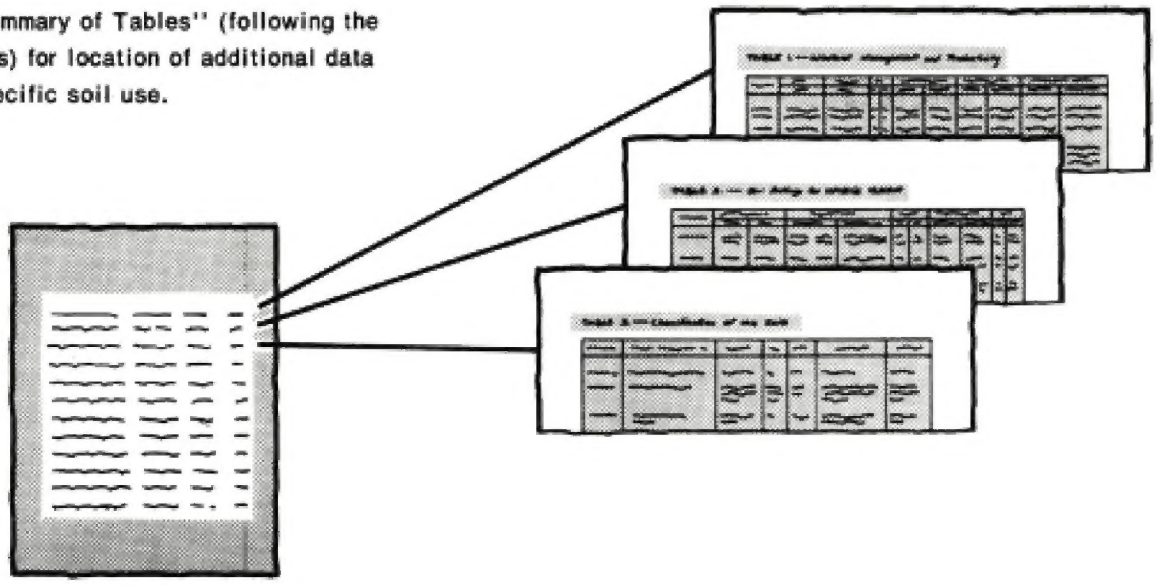


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was performed in the period 1963-78. Soil names and descriptions were approved in 1979. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1978. This survey was made cooperatively by the Soil Conservation Service, Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission. It is part of the technical assistance furnished to the Bradford County Conservation District and the Sullivan County Conservation District. Financial assistance was provided by the Department of Housing and Urban Development under provisions of Section 701 of the Housing Act of 1954, as amended; by the Pennsylvania Department of Environmental Resources, Bureau of Community Environmental Control; and by the Sullivan County Board of Commissioners.

Cover: Area of Alton-Pope-Chenango general soil map unit. Pope soils are in foreground and Alton and Chenango soils are in the middle distance. The ridge is in the Volusia-Mardin-Lordstown map unit.

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Issued August 1986

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foreword

This soil survey contains information that can be used in land-planning programs in Bradford and Sullivan Counties. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Graham T. Munkittrick

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State Conservationist
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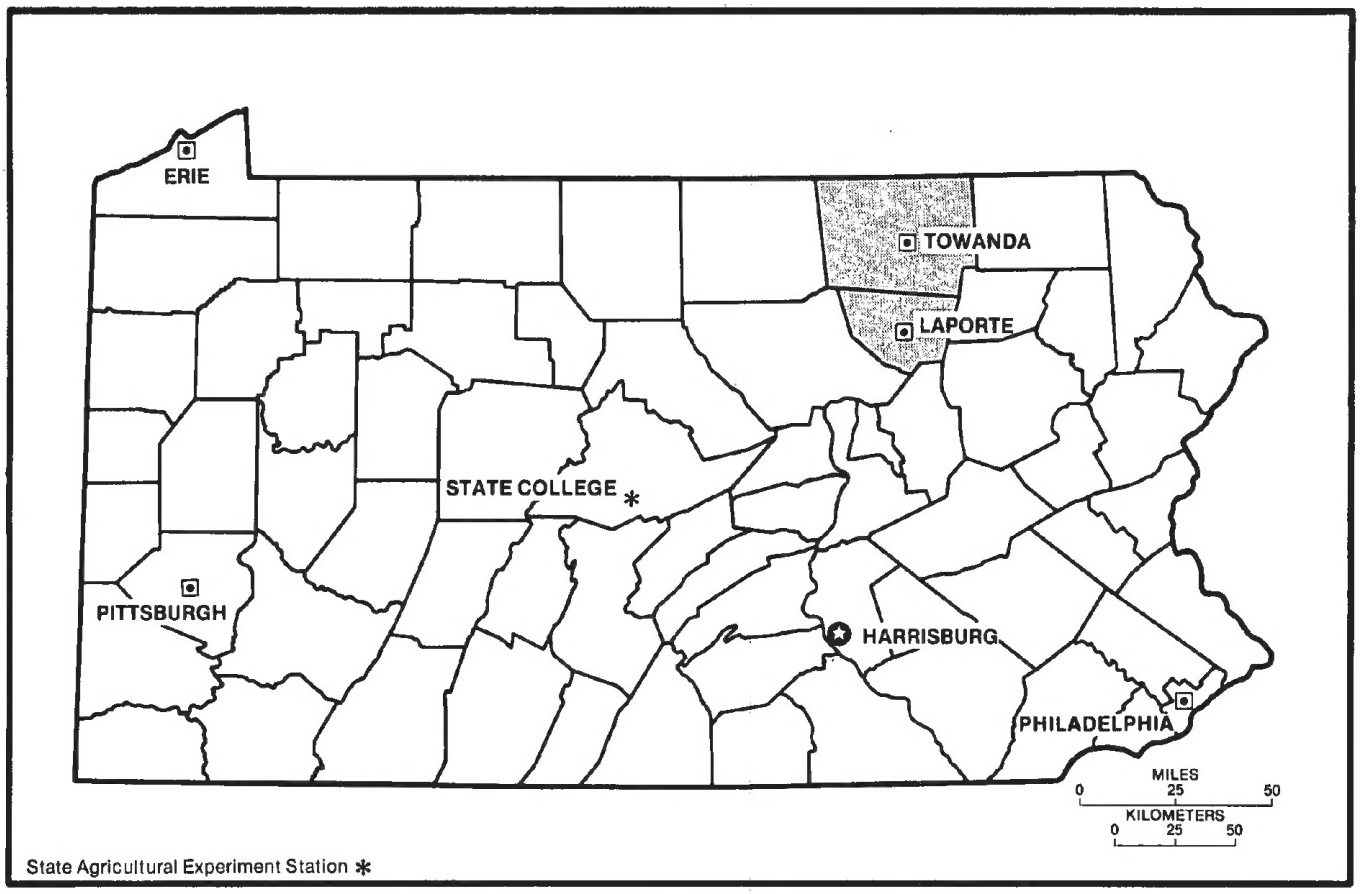

Location of Bradford and Sullivan Counties in Pennsylvania.

soil survey of Bradford and Sullivan Counties, Pennsylvania

By Robert G. Grubb, Soil Conservation Service

Fieldwork by Robert G. Grubb, R. Gary Otis, Sylvester C. Ekart, Gerald Latshaw, Donald Holzer, and Robert Malmgren, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service
in cooperation with
Pennsylvania State University, College of Agriculture, and
Pennsylvania Department of Environmental Resources,
State Conservation Commission

Bradford and Sullivan Counties are in northeastern Pennsylvania. The survey area consists of all of the two counties—1,046,400 acres, or 1,635 square miles. Bradford County makes up 71 percent of the survey area, and Sullivan County makes up 29 percent. Bradford County has a population of 60,587, and Sullivan County has a population of 5,980.

The survey area is part of the dissected Allegheny Plateau (*3*). It has rolling hills, deeply entrenched streams, and very steep mountains. Sullivan County is the more mountainous of the two. Elevation in the survey area ranges from 660 feet along the Susquehanna River where it leaves Bradford County to 2,585 feet at North Mountain Lookout Tower south of Sonestown in Sullivan County.

More than 60 percent of the survey area is soils that have a seasonal high water table and associated wetness problems. Much of the remaining area has problems caused by shallow or moderate depth to bedrock. About half of the area is nonstony and is used for crops, pasture, woodland, or residential and industrial sites or is idle; the other half is very stony or extremely stony and is used for woodland and recreation.

A soil survey of Bradford County was published in 1911 (*7*). The present survey updates the earlier one. This survey provides additional information and maps that show the soils in greater detail.

general nature of the area

This section discusses the geology and climate of Bradford and Sullivan Counties.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

In Bradford and Sullivan Counties, winter is cold and summer is moderately warm with occasional hot spells. Mountains are markedly cooler than the main farming areas in the lowlands. Precipitation is well distributed throughout the year and is nearly always adequate for all crops. Winter snows occur frequently, occasionally as blizzards. Snow covers the ground much of the time.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Towanda in the period 1951 to 1974. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 28 degrees F and the average daily minimum temperature is 18

degrees. The lowest temperature on record, which occurred at Towanda on January 29, 1963, is -23 degrees. In summer the average temperature is 69 degrees, and the average daily maximum temperature is 82 degrees. The highest recorded temperature, which occurred on September 2, 1953, is 101 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 34 inches. Of this, 19 inches, or 55 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 16 inches. The heaviest 1-day rainfall during the period of record was 3.81 inches at Towanda on June 23, 1972. Thunderstorms occur on about 30 days each year, and most occur in summer.

Average seasonal snowfall is 48 inches. The greatest snow depth at any one time during the period of record was 30 inches. On an average of 33 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 65 percent. Humidity is higher at night, and the average at dawn is about 85 percent. The sun shines 60 percent of the time possible in summer and 40 percent in winter. The prevailing wind is from the west-southwest. Average windspeed is highest, 12 miles per hour, in winter.

geology

Dr. Edward J. Ciolkosz, professor of soil genesis and morphology, Pennsylvania State University, prepared this section.

During most of the Paleozoic Era (600 to 230 million years ago) the area of Bradford and Sullivan Counties was covered by a shallow sea. This sea received sandy, silty, and clayey sediments at various times during the Paleozoic Era. At the close of the Paleozoic, these sediments were raised above sea level and compacted and cemented into the bedrock that presently underlies these counties. This bedrock is of Devonian (405 to 350 million years ago), Mississippian (350 to 310 million years ago), and Pennsylvanian (310 to 280 million years ago) age (*11*).

The Devonian bedrock is primarily the Susquehanna Group, which comprises the Oswayo Formation (brownish and greenish gray, fine-grained and medium-grained sandstone with some shale and scattered calcareous lenses), the Catskill Formation (chiefly red to brownish shale and sandstone), and marine beds (gray to olive brown shale, graywacke, and sandstone). The Mississippian bedrock is primarily the Pocono Group (predominantly gray, hard, massive, cross-bedded conglomerate and sandstone with some shale). The Pennsylvanian bedrock is primarily the Pottsville Group (light gray to white, coarse-grained sandstone and conglomerate with some mineable coal).

The post-Paleozoic in this area was primarily a time of erosion in which the landscape was a worn down to a flat, featureless plain and then raised again by geologic forces. The last cycle of upwarping and erosion was interrupted about 1 million years ago by the advance of glacial ice from the north. During the ice age (Pleistocene Epoch), glaciers moved over and retreated from the northern part of the United States four times (*5*). It is not known for certain if all four ice advances covered the area of Bradford and Sullivan Counties; at least two did. The last, or Wisconsin, ice advance retreated from the area 12,000 to 15,000 years ago. The Wisconsin Glacier is the only ice advance that has left a significant record of its presence (*4*). As the Wisconsin ice, and possibly earlier ice, advanced over the area it ground down the hilltops and filled in the valleys, flattening the area. Besides scouring the landscape, the Wisconsin Glacier deposited large amounts of glacial till on the uplands and side slopes and glacial outwash and lacustrine deposits in the river valleys. These glacial materials, which were derived from the bedrock of the area, became the parent material of many of the soils of these counties.

Although the glacier reduced the relief of the area by grinding and filling, it did not obscure the preglacial topography. The major ridges and mountains that were present prior to glaciation remain today. The softer shale in the northern part of the area may have been eroded by the glaciers more than the harder Mississippian and Pennsylvanian sandstone that forms the high uplands in the southern part of the area. This difference in glacial erosion may have increased the difference in elevation between the northern and southern parts of this area.

In this area the bedrock has greatly affected the nature of the glacial deposits. In the northern part of the area the bedrock is primarily gray shale and sandstone of Devonian age. These rocks produced the grayish brown till in which Volusia, Mardin, and Lordstown soils developed. In the southern part of the area the sandstone and conglomerate of Pennsylvanian and Mississippian age imparted a slightly coarser texture to the till. The shale and sandstone of the Catskill Formation gave a distinctive red color to the parent material of Oquaga, Wellsboro, and Morris soils. The glacial outwash derived from various kinds of bedrock became the parent material of Chenango and Alton soils. Recent alluvium, which is in large part reworked glacial till and outwash, is the parent material of Pope soils.

The geology of an area determines the extent of its mineral industries, and in Bradford and Sullivan Counties these are not extensive. In Bradford County the glacial outwash deposits (kames and kame terraces) are mined for sand and gravel. In Sullivan County some anthracite

coal is strip mined. In 1975 Sullivan County produced 28,408 short tons of coal.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The boundaries of the map units of the general soil maps of Bradford and Sullivan Counties do not consistently match those on the maps of adjoining counties. The discrepancies exist because of differences in legend design, changes in the concepts of individual series, and differences in the extent of the same soils in adjoining counties. However, adjacent areas in adjoining counties contain similar kinds of soil.

soil descriptions

1. Volusia-Mardin-Lordstown

Deep and moderately deep, gently sloping to moderately steep, somewhat poorly drained to well drained soils; on broad hillsides and hilltops

These soils are on broad hillsides and hilltops dissected by drainageways (fig. 1). The soils are mainly

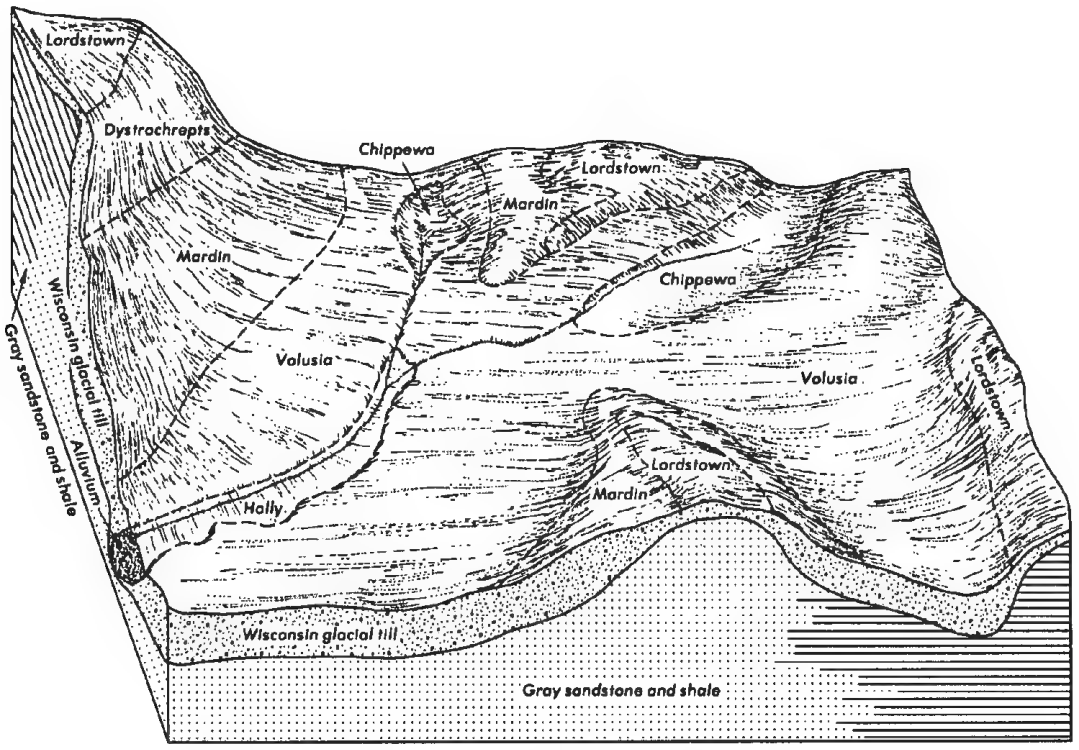

Figure 1.—Typical pattern of soils and parent material in the Volusia-Mardin-Lordstown map unit.

sloping, but some on hillsides are steeper. This map unit makes up about 38 percent of the survey area and is entirely within Bradford County. It is 52 percent Volusia soils, 14 percent Mardin soils, 12 percent Lordstown soils, and 22 percent minor soils.

Volusia soils are deep and somewhat poorly drained. They have a fragipan and a seasonal high water table. Mardin soils are deep and moderately well drained. They have a fragipan and a seasonal high water table. Lordstown soils are moderately deep and well drained.

Minor soils include Oquaga, Arnot, Wellsboro, and Morris soils and deep Dystrochrepts on uplands; Chippewa soils and Medisaprists in lowlands and swamps; Wyoming, Chenango, and Rexford soils on terraces; and Holly and Pope soils and Udifluvents on flood plains.

Most of this map unit is farmland. The rest is woodland and scattered residential sites or is idle. Most of the farmland is in dairy farms.

Suitability for cultivated crops and pasture is only fair to good in most areas because of the seasonal high water table and moderate depth to bedrock. Suitability of the very stony soils for crops and pasture is poor. Woodland productivity is moderately high and high. Moderate depth to bedrock, the seasonal high water table, slow and very slow permeability, and the very stony surface limit nonfarm uses of the soils.

2. Morris-Oquaga-Wellsboro

Deep and moderately deep, sloping to steep, somewhat poorly drained to somewhat excessively drained soils; on narrow hillsides and hilltops

These soils are on narrow hillsides and hilltops dissected by drainageways (fig. 2). The soils are mainly sloping, but some on hillsides are steeper. This map unit makes up about 23 percent of the survey area. It is 43 percent Morris soils, 15 percent Oquaga soils, 12 percent Wellsboro soils, and 30 percent minor soils.

Morris soils are deep and somewhat poorly drained. They have a fragipan and a seasonal high water table. Oquaga soils are moderately deep and are well drained and somewhat excessively drained. Wellsboro soils are deep and are moderately well drained and somewhat poorly drained. They have a fragipan and a seasonal high water table.

Minor soils include Dystrochrepts and Arnot and Volusia soils on uplands; Chippewa and Norwich soils and Medisaprists in lowlands and swamps; Wyoming, Chenango, Braceville, and Rexford soils on terraces; and Holly and Linden soils and Udifluvents on flood plains.

Most of this map unit is farmland. The rest is woodland or scattered residential sites or is idle. Most of the farmland is in dairy farms, but some is used for potatoes.

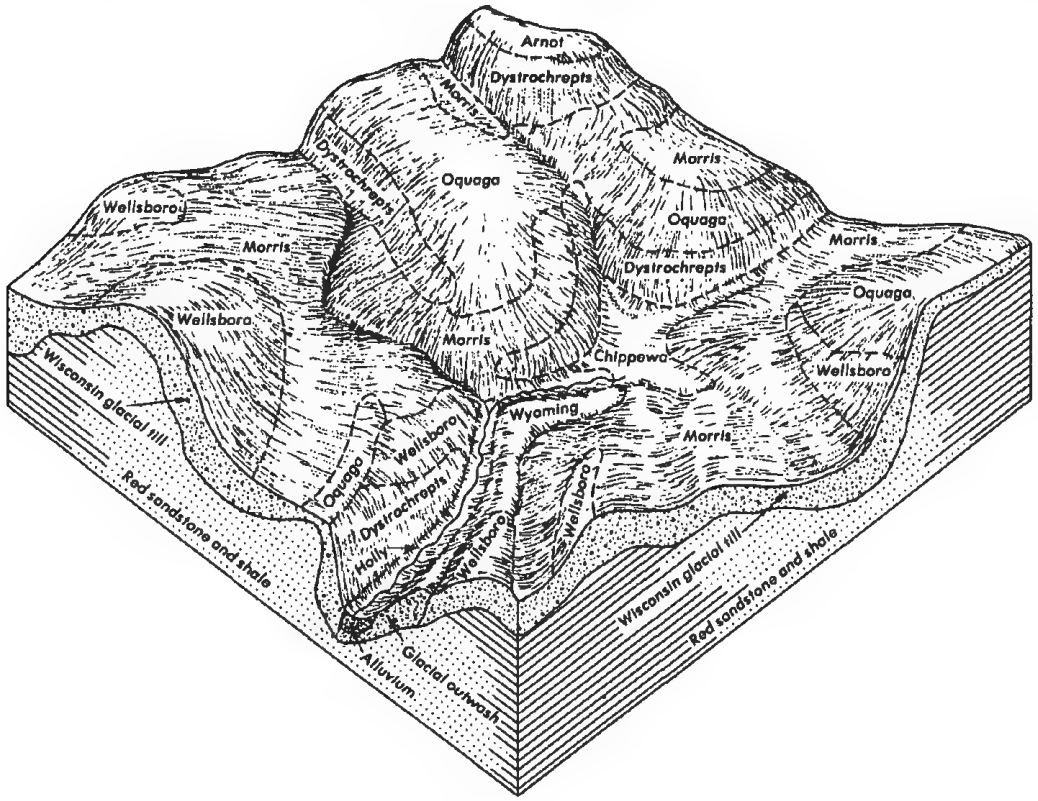

Figure 2.—Typical pattern of soils and parent material in the Morris-Oquaga-Wellsboro map unit.

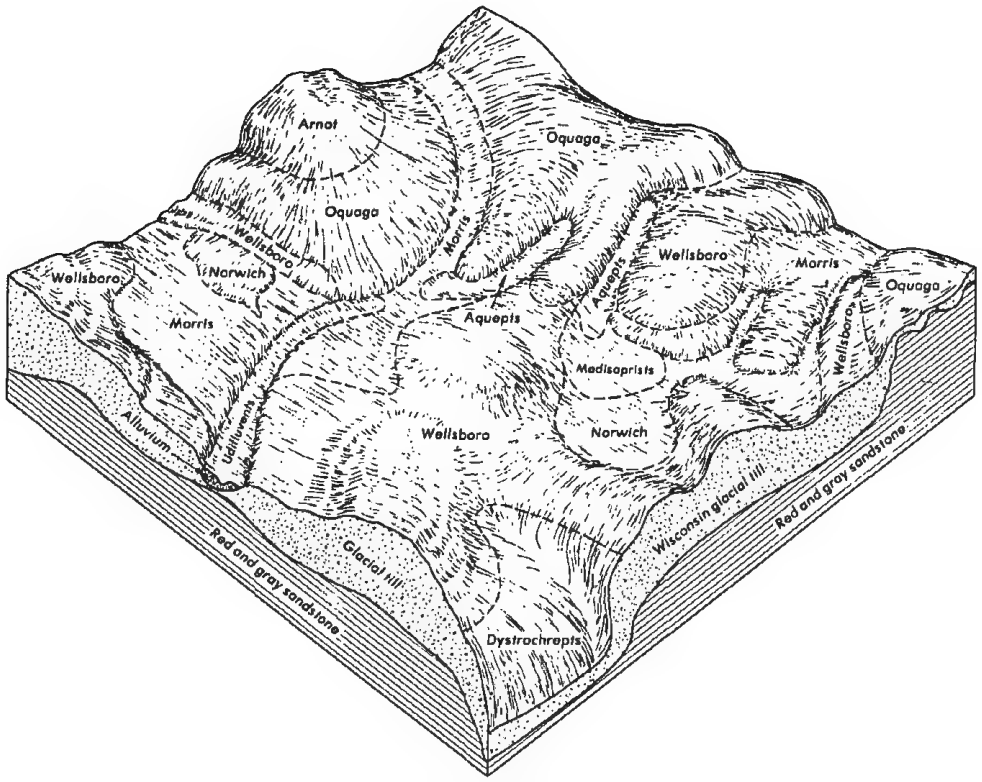

Figure 3.—Typical pattern of soils and parent material in the Wellsboro-Oquaga-Morris map unit.

Suitability for cultivated crops and pasture is only fair to good in most areas because of slope, the seasonal high water table, and moderate depth to bedrock. Suitability of the very stony soils for crops and pasture is poor. Woodland productivity is moderately high or high. Moderate depth to bedrock, the seasonal high water table, slow and very slow permeability, and the very stony surface limit nonfarm uses of the soils.

3. Wellsboro-Oquaga-Morris

Deep and moderately deep, gently sloping to moderately steep, somewhat excessively drained to somewhat poorly drained soils; on broad plateaus and mountaintops

These soils are on broad plateaus and mountaintops dissected by drainageways (fig. 3). The soils are mainly gently sloping and sloping but some on side slopes are steeper. This map unit makes up 20 percent of the survey area. It is 32 percent Wellsboro soils, 22 percent Oquaga soils, 18 percent Morris soils, and 28 percent minor soils.

Wellsboro soils are deep and are moderately well drained and somewhat poorly drained. They have a fragipan and a seasonal high water table. Oquaga soils are moderately deep and are well drained and somewhat excessively drained. Morris soils are deep and somewhat poorly drained. They have a fragipan and a seasonal high water table.

Minor soils include Arnot soils, Dystrochrepts, and Udorthents on uplands; Norwich soils, Aquepts, and Medisaprists in lowlands and swamps; and Udifluvents and Holly and Linden soils on flood plains.

Most of this map unit is wooded. Some areas have been cleared and are used for farmland or residential sites or are idle. These soils can be used for wildlife habitat and recreation.

These soils are mostly too stony for cultivated crops. Some areas are subject to frosts in late spring. In cleared areas, suitability for cultivated crops and pasture is only fair because of the seasonal high water table, moderate depth to bedrock, and frost hazard. Woodland productivity is moderately high and high. Moderate depth to bedrock, the seasonal high water table, slow and very slow permeability, and the very stony surface limit nonfarm uses of the soils.

4. Dystrochrepts-Oquaga-Wellsboro

Deep and moderately deep, moderately steep to very steep, somewhat excessively drained to somewhat poorly drained soils; on mountainsides and in narrow stream valleys

These soils are on mountainsides and in the associated stream valleys. The soils are mainly very steep, but some soils in the valleys are nearly level to moderately steep. This map unit makes up about 16 percent of the survey area. It is about 27 percent

Dystrochrepts, 20 percent Oquaga soils, 15 percent Wellsboro soils, and 38 percent minor soils.

Dystrochrepts are well drained and somewhat excessively drained. Oquaga soils are moderately deep and are well drained and somewhat excessively drained. Wellsboro soils are deep and are moderately well drained and somewhat poorly drained. They have a fragipan and a seasonal high water table.

Minor soils include Ochrepts and Lordstown, Arnot, Mardin, and Morris soils on uplands, along with Rock outcrop; Wyoming and Chenango soils on terraces; and Udifluvents and Linden and Holly soils on flood plains.

Most of this map unit is wooded. Some areas have been cleared and are used for farmland or residential sites or are idle. Farmed areas are in narrow valleys, usually on flood plains and terraces. These soils can be used for wildlife habitat and recreation.

These soils are mostly too steep and stony for cultivated crops and pasture. Woodland productivity is low to high, but harvesting is difficult because of steep slope, rock outcrops, and the extremely stony surface. Steep slope, the extremely stony surface, and moderate depth to bedrock limit nonfarm uses of the soils.

5. Alton-Pope-Chenango

Deep, nearly level and gently sloping, somewhat excessively drained and well drained soils; on uplands, terraces, and flood plains

These soils are on uplands, terraces, and flood plains near the Susquehanna and Chemung Rivers and their larger tributaries (fig. 4). The soils on the terraces and nearby uplands are mainly nearly level and gently sloping, but some on side slopes are sloping to very steep. Soils on the flood plains are nearly level. This map unit makes up about 3 percent of the survey area and is entirely within Bradford County. It is about 22 percent Alton soils, 20 percent Pope soils, 15 percent Chenango soils, and 43 percent minor soils.

Alton soils are deep and are well drained and somewhat excessively drained. Pope soils are deep and well drained and are occasionally flooded. Chenango soils are deep and are well drained and somewhat excessively drained.

Minor soils include Unadilla soils on terraces and Lordstown soils on nearby uplands; Rexford and Braceville soils on terraces; and Holly soils and Udifluvents on flood plains.

Most of this map unit has been cleared and is used for farmland and residential sites. A small amount is woodland or is idle. Most of the farmland is in dairy farms, but some is used for vegetables and small fruits.

Suitability for cultivated crops and pasture is good. Woodland productivity is moderately high and high. Flooding and the hazard of contaminating ground water limit nonfarm uses of these soils.

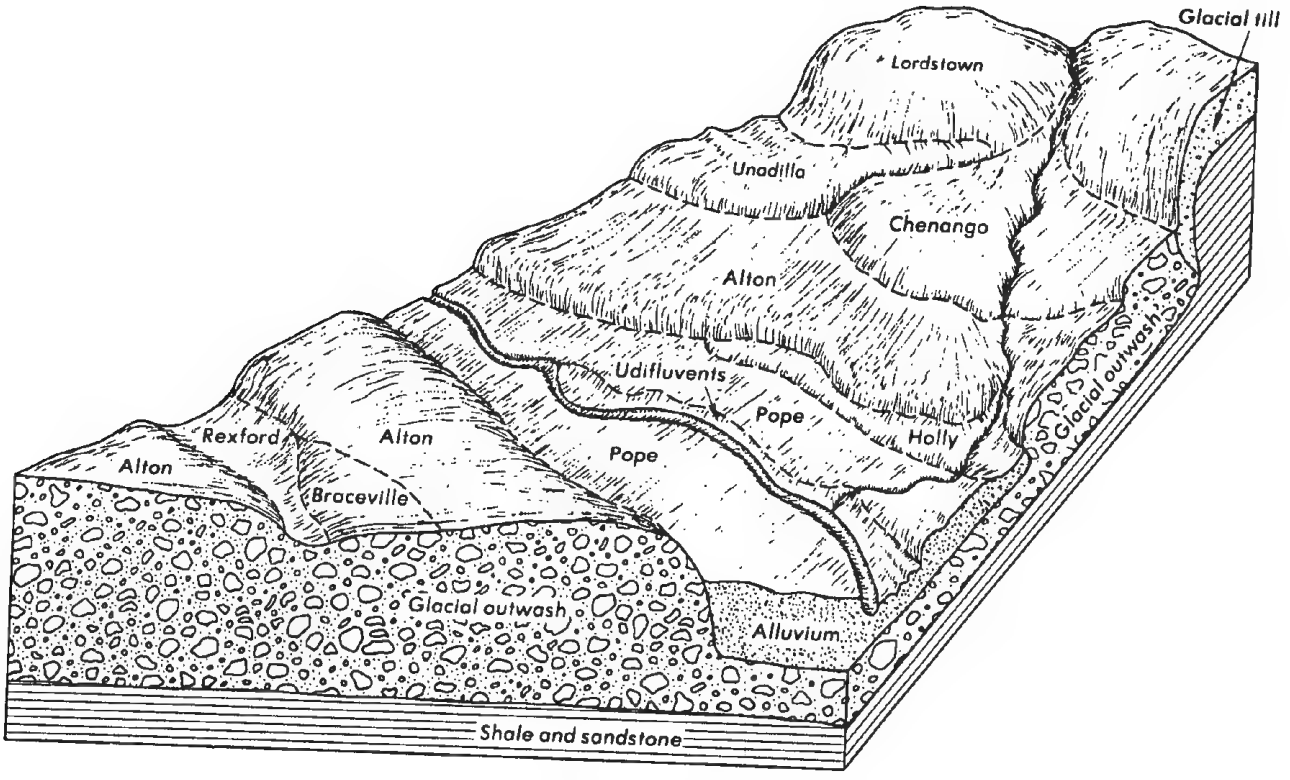

Figure 4.—Typical pattern of soils and parent material in the Alton-Pope-Chenango map unit.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Wellsboro very stony silt loam, 3 to 8 percent slopes, is one of several phases in the Wellsboro series.

Some map units are made up of two or more major soils. These map units are called soil complexes, soil associations, or undifferentiated groups.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Arnot-Rock outcrop complex, 3 to 25 percent slopes, is an example.

A *soil association* is made up of two or more geographically associated soils that are shown as one unit on the maps. Because of present or anticipated soil uses in the survey area, it was not considered practical or necessary to map the soils separately. The pattern and relative proportion of the soils are somewhat similar. Dystrochrepts, deep-Wellsboro-Oquaga association, steep, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Pope soils is an undifferentiated group in this survey area.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Dumps, mine, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

soil descriptions

AgB—Alton gravelly sand loam, 0 to 8 percent slopes. This nearly level and gently sloping, well drained and somewhat excessively drained soil is on stream terraces adjacent to major streams in Bradford County. The areas are rounded to elongated and range from 5 to 100 acres.

Typically, the surface layer is very dark grayish brown gravelly sandy loam about 8 inches thick. The subsoil is yellowish brown and brown gravelly sandy loam to a depth of 36 inches. The substratum is brown and dark yellowish brown very gravelly loamy sand to a depth of 60 inches.

Included with this soil in mapping are small areas of Unadilla, Chenango, and Braceville soils. Also included are a few area of Alton soils that have a cobbly sandy loam or gravelly loam surface layer and a few areas of

sloping Alton soils. Inclusions make up as much as 25 percent of the mapped acreage.

This Alton soil has rapid permeability. Available water capacity is low to moderate. Surface runoff is slow. The surface layer is 20 to 50 percent coarse fragments. In unlimed areas the surface layer is strongly acid to slightly acid, the upper part of the subsoil is strongly acid to neutral, and the lower part of the subsoil and the substratum are medium acid to mildly alkaline.

Most areas of this soil are used for cultivated crops. A few areas are used for pasture, and a few are used for woodland. The rest are being developed for urban uses.

If this soil is cultivated, the erosion hazard is slight to moderate. Cover crops, crop rotation, and use of crop residue and manure control erosion, increase available water capacity, and help maintain organic matter content and good tilth. Yields decrease during dry years because of the low to moderate available water capacity. The gravelly surface interferes with seeding and mechanical harvesting of some crops.

The chief management needs for pasture are proper stocking rates to maintain key plant species, pasture rotation, and periodic applications of nutrients.

Productivity of trees is moderately high. Management problems are few. Machine planting is practical.

Some nonfarm uses are limited by the rapid permeability and large content of coarse fragments. Ground water can be contaminated by seepage through the rapidly permeable substratum. Deep excavations are unstable because of the large content of coarse fragments. Lawns often need additions of topsoil because of the content and size of coarse fragments.

This soil is in capability subclass IIs and woodland group 3o.

Ao—Aquepts, rubbly. These nearly level to gently sloping, somewhat poorly drained to very poorly drained soils are in depressional and concave areas on mountaintops and plateaus. These soils are mainly in Sullivan County. Some areas of this map unit are rounded and some are narrow. The areas range from 5 to 30 acres.

These soils are quite variable. Stones and boulders 1 to 5 feet in diameter cover 50 to 100 percent of the surface. The surface layer is generally 5 to 20 inches of rock fragments mixed with leaves, organic matter, air, water, and as much as 25 percent black, dark gray, and brown loam to silty clay loam. The subsurface layer is generally black to light gray sandy loam to light silty clay loam. The subsoil and substratum are very dark gray to light yellowish brown sandy loam to light silty clay loam.

Included with these soils in mapping are small areas of boulders and stones without a plant cover, rock outcrops, Norwich and Morris soils, and Medisaprists. Inclusions make up as much as 10 percent of the mapped acreage.

Aquepts have very rapid and rapid permeability. The available water capacity is very low to low. In some areas, water is ponded; in others, runoff is slow to medium. A high water table is above a depth of 12 inches during wet periods. Rooting depth is restricted by the high water table and by droughtiness in summer.

Most areas of these soils are used for woodland.

These soils are too wet and too stony for cultivated crops or for pasture. Removing the stones and draining the soils are usually not feasible.

Woodland productivity is low. Some of the areas of Aquepts are too stony and too wet for trees. The gently sloping areas with a thin cover of stones and boulders will support water-tolerant and drought-resistant trees. The stoniest areas support hardhack and blueberry. Equipment limitations, windthrow hazard, and seedling mortality are all caused by the high water table and large stones. The stones and wetness interfere with machine planting.

The stones and the high water table seriously limit use for onsite waste disposal, houses, and most other nonfarm uses.

These soils are not placed in a capability subclass or woodland group.

ArC—Arnot very channery loam, rocky, 3 to 15 percent slopes. This gently sloping and sloping, shallow, somewhat excessively drained to moderately well drained soil is on knolls, ridges, and upper hillsides. Most areas are elongated, but on knolls they are rounded. The areas range from 5 to 65 acres. Rock outcrops make up 0.1 to 1.0 percent of the surface.

Typically, the surface layer is dark grayish brown very channery loam about 5 inches thick. The subsoil is brown very channery silt loam and channery loam. Light gray sandstone bedrock is at a depth of 15 inches.

Included with this soil in mapping are small areas of Oquaga and Lordstown soils. Also included are a few areas of shallow soils that contain less than 35 percent coarse fragments throughout. Inclusions make up as much as 25 percent of the mapped acreage.

This Arnot soil has moderate permeability and very low available water capacity. Surface runoff is rapid. The surface layer is 50 to 70 percent coarse fragments. In unlimed areas this soil is medium acid to extremely acid throughout. Rooting depth is restricted by the bedrock.

Most areas of this soil are used for hay and pasture. A few areas are used for cultivated crops or for woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

This soil is not suited to cultivated crops because of the rock outcrops and very low available water capacity. The erosion hazard is very severe.

The chief management needs for pasture are proper stocking rates to maintain key plant species, pasture rotation, periodic applications of nutrients, and plowing only for reseeding.

Productivity of trees is moderate. The very low available water capacity causes severe seedling mortality. Windthrow hazard is moderate because rooting depth is restricted by the shallow bedrock.

Shallow depth to bedrock and rock outcrops seriously limit use for onsite waste disposal, houses, landscaping, and most other nonfarm uses. Control of erosion and sedimentation are needed on areas disturbed for construction.

This soil is in capability subclass VIs and woodland group 4d.

AsD—Arnot-Rock outcrop complex, 3 to 25 percent slopes. This complex consists of a gently sloping to moderately steep, shallow, somewhat excessively drained to moderately well drained soil and Rock outcrop on narrow ridges, broad mountaintops, and mountain edges adjacent to steep escarpments. Most areas are elongated and range from 5 to 600 acres. Areas of the Arnot soil and Rock outcrop are so intricately mixed that it was not practical to separate them in mapping.

The Arnot soil makes up about 65 percent of the complex. Typically, the surface layer is brown very channery loam about 2 inches thick. The subsoil is strong brown and brown very channery loam, very channery silt loam, and channery loam. Light gray sandstone bedrock is at a depth of 15 inches.

Rock outcrop makes up about 15 percent of the complex. It consists of bare exposures and outcroppings of massive sandstone and shale bedrock.

Included in mapping are small areas of Lordstown and Oquaga soils. Also included are a few areas of shallow and moderately deep wetter soils. Inclusions make up as much as 20 percent of the mapped acreage.

The Arnot soil has moderate permeability and very low available water capacity. Surface runoff is moderate to very rapid. Stones and boulders cover 15 to 50 percent of the surface. In unlimed areas this soil is medium acid to extremely acid throughout. Rooting depth is restricted by bedrock.

Most areas of this complex are used for woodland. Very few areas are used for pasture. The rest are being developed for urban uses.

No areas of this complex are cultivated. This complex is too stony and rocky for cultivated crops and pasture, and removing the stones and trees is not feasible.

Productivity of trees on the Arnot soil is moderate. The very low available water capacity causes severe seedling mortality. Windthrow hazard is moderate because rooting depth is restricted by the shallow bedrock. Rock outcrops and large stones limit machine planting and use of other equipment.

The moderately steep slope, shallow bedrock, rock outcrops, and large stones on the surface seriously limit use for onsite waste disposal, housing sites, landscaping, and most other nonfarm uses. Control of erosion and sedimentation is needed in areas disturbed for construction.

This complex is in capability subclass VIs. Arnot part is in woodland group 4d.

BaB—Braceville silt loam, 0 to 8 percent slopes. This nearly level and gently sloping, somewhat poorly drained and moderately well drained soil is along major and secondary streams on stream terraces and terraces on valley sides. The areas are narrow to broadly rectangular and range from 5 to 50 acres.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil extends to a depth of 37 inches. The upper 10 inches of the subsoil is yellowish brown silt loam and brown loam; the next 4 inches is mottled, brown loam; and the lower 15 inches is a fragipan of mottled, brown gravelly loam. The substratum is gray very fine sandy loam and reddish brown gravelly sandy loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Alton, Chenango, Wyoming, and Rexford soils. Also included are a few areas of soils that are less acid in the subsoil and areas of soils that have a redder subsoil. Inclusions make up as much as 25 percent of the mapped acreage.

This Braceville soil has moderately slow and slow permeability. The available water capacity is low to moderate. Surface runoff is slow and medium. In unlimed areas the surface layer and upper part of the subsoil are very strongly acid to medium acid, and the lower part of the subsoil and the substratum are strongly acid to slightly acid. A seasonal high water table is at a depth of 12 to 36 inches during wet periods. Rooting depth is restricted by the fragipan and the seasonal high water table.

Most areas of this soil are used for cultivated crops. A few areas are used for pasture or woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is slight to moderate. Use of crop residue, stripcropping, crop rotation, and minimum tillage reduce runoff and control erosion. Surface and subsurface drains remove excess water and allow timely tillage.

The chief management needs for pasture are proper stocking rates to maintain key plant species, restricted grazing during wet periods, pasture rotation, and periodic applications of nutrients.

Productivity of trees is high. Management problems are few. Use of equipment may be temporarily limited during wet periods by the seasonal high water table. Machine planting is practical.

The seasonal high water table and moderately slow and slow permeability seriously limit use for onsite waste disposal, houses with subsurface basements, and many other nonfarm uses. Ground water can be contaminated by seepage in areas where the substratum is rapidly permeable. Control of erosion and sedimentation is needed in areas disturbed for construction.

This soil is in capability subclass IIw and woodland group 2o.

CaA—Canadice silty clay loam, 0 to 3 percent slopes. This nearly level, poorly drained soil is on low

lake plains, in ponded areas along stream valleys, and on depressional to nearly level uplands near the heads of drainageways. The areas are narrow to broadly rectangular and range from 5 to 100 acres.

Typically, the surface layer is very dark gray silty clay loam about 9 inches thick. The subsoil extends to a depth of 45 inches and is gray, grayish brown, and olive gray silty clay loam and silty clay with dominantly gray mottles. To a depth of 60 inches, the substratum is stratified brown, light olive brown, and gray silt to silty clay loam with very thin layers of fine sand.

Included with this soil in mapping are small areas of Chippewa, Rexford, and Holly soils and Medisaprists. Also included are a few areas of a soil with lower reaction in the subsoil and a soil with a reddish brown subsoil. Inclusions make up as much as 25 percent of the mapped acreage.

This Canadice soil has very slow permeability. The available water capacity is high. Surface runoff is slow to ponded. In unlimed areas the surface layer is strongly acid to slightly acid, the upper part of the subsoil is strongly acid to neutral, the lower part of the subsoil is slightly acid to mildly alkaline, and the substratum is neutral to moderately alkaline. Shrinkage cracks form in the surface layer and upper part of the subsoil during dry periods. During wet periods a seasonal high water table is at a depth of 0 to 6 inches. Rooting depth is restricted by the seasonal high water table.

Many areas of this soil are used for pasture. A few areas are used for cultivated crops or for woodland. The rest are being developed for urban uses or are idle.

If this soil is cultivated, the erosion hazard is slight. The large clay content of the plow layer and the high water table make cultivation difficult. Excess water causes the soil to warm slowly in spring. Surface drains remove excess water and allow timely tillage. Cover crops, crop rotation, and use of crop residue and manure help maintain organic matter content and good tilth.

The chief management needs for pasture are restricted grazing during wet periods, proper stocking rates to maintain key plant species, pasture rotation, and periodic applications of nutrients.

Productivity of trees is low. Use of equipment is limited by the seasonal high water table and the clayey texture. Seedling mortality is severe and windthrow hazard is moderate because of the seasonal high water table. Machine planting is practical during drier periods.

The high water table and very slow permeability seriously limit use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses.

This soil is in capability subclass IVw and woodland group 5w.

CnB—Chenango gravelly loam, 0 to 8 percent slopes. This nearly level and gently sloping, well drained and somewhat excessively drained soil is on terraces where tributaries enter their major stream and on low terraces along secondary streams. Areas at the mouth of tributaries are shaped like a fan or triangle, and areas along the secondary streams are long and narrow. The areas range from 5 to 120 acres. Severe flooding may occur when debris blocks the stream channel.

Typically, the surface layer is dark brown gravelly loam about 9 inches thick. The subsoil extends to a depth of 30 inches and is yellowish brown gravelly loam and gravelly fine sandy loam. The substratum is brown very gravelly sand to a depth of 60 inches.

Included with this soil in mapping are small areas of Alton, Braceville, and Wyoming soils and Udifluvents. Also included are a few areas of Chenango soils that have a cobbly loam or loam surface layer and a few areas of a soil that is similar to Chenango soils but that has a reddish brown subsoil. Inclusions make up as much as 25 percent of the mapped acreage.

This Chenango soil has moderate and moderately rapid permeability and low to moderate available water capacity. Surface runoff is slow. The surface layer is 15 to 30 percent coarse fragments. In unlimed areas the surface layer is very strongly acid to strongly acid, the subsoil is very strongly acid to medium acid, and the substratum is strongly acid to slightly acid.

Most areas of this soil are used for cultivated crops. A few areas are used for pasture or for woodland. The rest are being developed for urban uses.

If this soil is cultivated, the erosion hazard is slight to moderate. Cover crops, crop rotation, stripcropping, and use of crop residue and manure control erosion, increase available water capacity, and help maintain organic matter content and good tilth. Yields decrease during dry years because of the low to moderate available water capacity. The gravelly surface interferes with seeding and mechanical harvesting of some crops.

The chief management needs for pasture are proper stocking rates to maintain key plant species, pasture rotation, and periodic applications of nutrients.

Productivity of trees is high. Management problems are few. Machine planting is practical.

Some nonfarm uses are limited by the rapid permeability in the substratum and the large content of coarse fragments. A few areas are subject to rare flooding. Ground water can be contaminated by seepage through the rapidly permeable substratum. Deep excavations are unstable because of the large content of coarse fragments. Lawns may need additions of topsoil because of the content and size of coarse fragments. Many areas are a potentially good source of gravel.

This soil is in capability subclass IIe and woodland group 2o.

CpA—Chippewa silt loam, 0 to 3 percent slopes. This nearly level, poorly drained and very poorly drained soil is in upland depressions. The areas are elongated to rounded and range from 5 to 120 acres.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsurface layer extends to a depth of 18 inches and is grayish brown and gray

silt loam and channery silt loam with dominantly gray mottles. The subsoil extends to a depth of 51 inches and is a fragipan of mottled grayish brown, olive brown, and dark brown channery silt loam. The substratum is mottled dark brown channery silt loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Volusia, Canadice, and Holly soils and Medisaprists. Also included are a few areas of nearly level Norwich soils. Inclusions make up as much as 20 percent of the mapped acreage.

This Chippewa soil has slow and very slow permeability and low to moderate available water capacity. Surface runoff is slow to ponded. In unlimed areas the surface and subsurface layers are very strongly acid to slightly acid, the subsoil is strongly acid to neutral, and the substratum is medium acid to moderately alkaline. A high water table is at a depth of 0 to 6 inches during wet periods and surface ponding is common. Rooting depth is restricted by the high water table.

Many areas of this soil are used for pasture, and many areas are used for woodland. A few areas are used for cultivated crops. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is slight. The high water table makes cultivation difficult. Excess water causes the soil to warm slowly in the spring. Surface and subsurface drains remove excess water and allow timely tillage. Cover crops, crop rotation, and use of crop residue and manure help maintain organic matter content and good tilth.

The chief management needs for pasture are proper stocking rates to maintain adapted plant species, pasture rotation, periodic applications of nutrients, and restricted grazing during wet periods.

Productivity of trees is low. Severe equipment limitations, windthrow hazard, and seedling mortality are all caused by the high water table. Machine planting is practical during drier periods.

The high water table, slow and very slow permeability, and slow runoff seriously limit use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses.

This soil is in capability subclass IVw and woodland group 5w.

CpB—Chippewa silt loam, 3 to 8 percent slopes. This gently sloping, poorly drained and very poorly drained soil is on concave hillsides below abrupt slope changes from which numerous wet-weather springs flow. The areas are elongated to rounded and range from 5 to 85 acres.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsurface layer extends to a depth of 18 inches and is grayish brown and gray silt loam and channery silt loam with dominantly pale brown and strong brown mottles. The subsoil extends to a depth of 51 inches and is a fragipan of mottled grayish brown, olive brown, and dark brown channery silt loam. The substratum is mottled, dark brown channery silt loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Volusia and Canadice soils. Also included are a few areas of gently sloping Norwich soils. Inclusions make up as much as 20 percent of the mapped acreage.

This Chippewa soil has slow and very slow permeability and low to moderate available water capacity. Surface runoff is slow. In unlimed areas the surface and subsurface layers are very strongly acid to slightly acid, the subsoil is strongly acid to neutral, and the substratum is medium acid to moderately alkaline. A high water table is at a depth of 0 to 6 inches during wet periods. Rooting depth is restricted by the high water table.

Many areas of this soil are used for pasture, and many areas are used for woodland. A few areas are used for cultivated crops. The rest are being developed for urban uses or are idle and produce wildlife habitat.

If this soil is cultivated, the erosion hazard is moderate. The high water table makes cultivation difficult. Excess water causes the soil to warm slowly in spring. Diversions and subsurface drains remove excess water and allow timely tillage. Use of crop residue, stripcropping, crop rotation, and minimum tillage reduce runoff and control erosion.

The chief managment needs for pasture are proper stocking rates to maintain adapted plant species, pasture rotation, periodic applications of nutrients, and restricted grazing during wet periods.

Productivity of trees is low. Severe equipment limitations, windthrow hazard, and seedling mortality are all caused by the high water table. Machine planting is practical during drier periods.

The high water table and slow and very slow permeability seriously limit use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses.

This soil is in capability subclass IVw and woodland group 5w.

Du—Dumps, mine. This map unit consists of nearly level to very steep piles of coal, carbonaceous shale, red dog, washings, and erosional sediments from deep-mining and strip-mining operations. The material is very poorly drained to excessively drained. The areas are rounded to irregular in shape and range from 5 to 30 acres.

Generally, these dumps have a 15-foot-thick mantle of coal and carbonaceous shale over glacial till or alluvium. Thickness of the mantle ranges from 2 feet over nearly level alluvium to 40 feet in conical coal piles over glacial till.

Included with Dumps in mapping are small areas of Holly, Morris, Wellsboro, and Oquaga soils and Udorthents. Inclusions make up as much as 10 percent of the mapped acreage.

The coal and coal shale mantle has very rapid permeability and very low available water capacity. The underlying glacial till and alluvium have very slow to moderate permeability. Surface runoff is ponded to very rapid. The material is extremely acid. It is highly susceptible to erosion and is a source of sediment that pollutes streams.

Dumps do not support a plant cover in their present condition. Coal piles suitable for fuel are being reworked. Burnt red-dog piles are a source of fill. Most of the map unit is not suited for agriculture, woodland, wildlife habitat, or urban uses without the total removal or covering of the coal and coal shale mantle.

Dumps are not placed in a capability subclass or woodland group.

DyF—Dystrochrepts, deep-Wellsboro-Oquaga association, steep. This association consists of deep and moderately deep, steep and very steep, somewhat poorly drained to somewhat excessively drained soils on mountainsides and hillsides. The soils are underlain by glacial till, residuum, and bedrock. The areas are narrow to elongated and range from 10 to 2,000 acres. The soils occur together in a recognizable pattern in all of the mapped areas; however, their relative proportions differ appreciably from one area to another. The individual soils could have been mapped separately but were not because interpretations and current use are uniform.

Dystrochrepts, deep, make up about 50 percent of the association. Stones and boulders 1 to 10 feet in diameter cover 0 to 50 percent of the surface and make up 10 to 50 percent of the soil. The surface layer is 2 to 10 inches of very dark grayish brown to dark brown loam or silt loam. The subsoil is 28 to 50 inches of olive brown to reddish yellow loam or silt loam. The substratum is olive brown to strong brown loam or silt loam to a depth of 60 inches or more.

Wellsboro soils make up about 15 percent of the association. Typically, the surface layer is dark brown extremely stony silt loam about 8 inches thick. The subsoil extends to a depth of 52 inches. The upper 6 inches of the subsoil is reddish brown channery silt loam; the next 6 inches is mottled, reddish brown channery silt loam; and the lower 32 inches is a fragipan of mottled, dark reddish brown channery loam. The substratum is mottled, dark reddish brown channery loam to a depth of 60 inches.

Oquaga soils make up about 15 percent of this association. Typically, the surface layer is dark reddish brown extremely stony silt loam about 7 inches thick. The subsoil extends to a depth of 25 inches and is reddish brown channery silt loam, very channery silt loam, and very shaly loam. The substratum is reddish brown very shaly loam. Dusky red shale and thin-bedded sandstone bedrock is at a depth of 32 inches.

Included with these soils in mapping are small areas of Arnot, Lordstown, and Mardin soils, Ochrepts, and Rock outcrop. Inclusions make up as much as 20 percent of the acreage mapped.

Dystrochrepts and Oquaga soils have moderate permeability, and Wellsboro soils have slow permeability. Available water capacity is moderate to high in Dystrochrepts, moderate in Wellsboro soils, and very low to moderate in Oquaga soils. Surface runoff is rapid and very rapid. Stones and boulders cover 0 to 50 percent of the surface of all of the soils. In unlimed areas Dystrochrepts are extremely acid to medium acid throughout, and Wellsboro and Oquaga soils are very strongly acid to medium acid throughout. Rooting depth is not restricted in Dystrochrepts; in Wellsboro soils it is restricted by the seasonal high water table and the fragipan, and in Oquaga soils it is restricted by bedrock.

This association is used for woodland.

Productivity of trees is moderately high and high. Slope and stones severely limit use of equipment. Machine planting is also limited by slope and stones.

Steep and very steep slope, the large stones on the surface, the seasonal high water table, slow permeability, and moderate depth to bedrock seriously limit use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses. Control of erosion and sedimentation are needed in areas disturbed for construction.

This association is in capability subclass VIIs. The Dystrochrepts are not placed in a woodland group; the Wellsboro soils are in group 2x, and the Oquaga soils are in group 3x.

Ho—Holly soils. These nearly level, very poorly drained and poorly drained soils are on flood plains. These soils are in backwater areas away from the larger stream channels and adjacent to poorly drained and somewhat poorly drained soils on terraces and uplands. Along the smaller streams these soils usually make up the entire flood plain. The surface layer is silt loam in some areas and loam in others. The areas are long and wavy and range from 5 to 110 acres. Flooding is frequent.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil extends to a depth of 37 inches and is mottled dark gray and light brownish gray silt loam. The substratum is stratified mottled grayish brown loam to a depth of 60 inches.

Included with these soils in mapping are small areas of Rexford, Canadice, Pope, and Linden soils, Medisaprists, and Udifluvents. Inclusions make up as much as 25 percent of the mapped acreage.

These Holly soils have moderate and moderately slow permeability and high available water capacity. Surface runoff is slow to ponded. In unlimed areas the surface layer and upper part of the subsoil are strongly acid to neutral, and the lower part of the subsoil and the substratum are medium acid to neutral. A high water table is at a depth of 0 to 6 inches during wet periods and surface ponding is common. Rooting depth is restricted by the high water table.

Many areas of these soils are used for cultivated crops, and many areas are used for pasture. A few areas

are used for woodland. The rest are being developed for urban uses or are idle and produce wildlife habitat.

If these soils are cultivated, the erosion hazard is slight. The high water table makes cultivation difficult. Excess water causes the soil to warm slowly in spring. Surface and subsurface drains remove excess water. Cover crops, short-term rotation, and use of crop residue help maintain organic matter content and good tilth and help control scouring during floods.

The chief management needs for pasture are proper stocking rates to maintain adapted plant species, pasture rotation, periodic applications of nutrients, and restricted grazing during wet periods.

Productivity of water-tolerant trees is very high. Severe equipment limitations, severe seedling mortality, and moderate windthrow hazard are all caused by flooding and the high water table. Machine planting is practical during drier periods.

Frequent flooding and the high water table seriously limit use for onsite waste disposal, houses, and most other nonfarm uses.

These soils are in capability subclass IIIw and woodland group 1w.

Ln—Linden soils. These nearly level, well drained soils are on flood plains, usually adjacent to the larger stream channels. The surface layer is silt loam in some areas and loam or fine sandy loam in others. The areas are long and wavy and range from 5 to 75 acres. Flooding is rare to common.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The subsoil extends to a depth of 45 inches and is dark reddish brown fine sandy loam. and silt loam. The substratum is reddish brown sandy loam to a depth of 60 inches.

Included with these soils in mapping are small areas of Udifluvents and Chenango and Holly soils. Also included are a few areas of a deep, moderately well drained soil that is similar to Linden soils. Included areas make up as much as 10 percent of the mapped acreage.

These Linden soils have moderately rapid permeability and high available water capacity. Surface runoff is slow. In unlimed areas these soils are very strongly acid to medium acid throughout. In some areas these soils have a seasonal high water table below a depth of 3 feet during wet periods.

Most areas of these soils are used for cultivated crops. A few areas are used for pasture or for woodland. The rest are being developed for urban uses.

If these soils are cultivated, the erosion hazard is slight. Cover crops, crop rotation, and use of crop residue help maintain organic matter content and good tilth and help control scouring during floods.

The chief management needs for pasture are proper stocking rates to maintain key plant species, pasture rotation, and periodic applications of nutrients.

Productivity of trees is very high. Management problems are few. Machine planting is practical.

Rare to common flooding seriously limits use for onsite waste disposal and houses. Ground water can be contaminated by seepage through the rapidly permeable substratum.

This soil is in capability class I and woodland group 1o.

LoB—Lordstown channery silt loam, 3 to 8 percent slopes. This gently sloping, moderately deep, well drained soil is on knolls and ridgetops. Areas are elongated on ridgetops and rounded on knolls and range from 5 to 140 acres. Small areas of rock outcrops occur throughout the unit.

Typically, the surface layer is dark grayish brown channery silt loam about 7 inches thick. The subsoil extends to a depth of 31 inches and is light olive brown channery silt loam. The substratum is light yellowish brown channery silt loam. Olive gray shale bedrock is at a depth of 34 inches.

Included with this soil in mapping are small areas of Arnot, Mardin, and Volusia soils. Also included are a few areas of moderately deep, moderately well drained soils that are similar to Lordstown soils. Inclusions make up as much as 15 percent of the mapped acreage.

This Lordstown soil has moderate permeability and moderate available water capacity. Surface runoff is medium. The surface layer is 15 to 35 percent coarse fragments. In unlimed areas this soil is medium acid to very strongly acid throughout. Rooting depth is restricted by the bedrock.

Many areas of this soil are used for cultivated crops, and many areas are used for pasture. A few areas are used for woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is moderate. Use of crop residue, stripcropping, crop rotation, and minimum tillage reduce runoff and control erosion.

The chief management needs for pasture are proper stocking rates to maintain key plant species, pasture rotation, and periodic applications of nutrients.

Productivity of trees is moderately high. Management problems are few. Machine planting is practical.

The moderate depth to bedrock seriously limits use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses. Control of erosion and sedimentation is needed on areas disturbed for construction.

This soil is in capability subclass IIe and woodland group 3o.

LoC—Lordstown channery silt loam, 8 to 15 percent slopes. This sloping, moderately deep, well drained soil is on knolls, ridges, and upper hillsides. Areas are elongated on ridges and rounded on knolls and range from 5 to 150 acres. Small areas of rock outcrops occur throughout the unit.

Typically, the surface layer is dark grayish brown channery silt loam about 7 inches thick. The subsoil

extends to a depth of 31 inches and is light olive brown channery silt loam. The substratum is light yellowish brown channery silt loam. Olive gray shale bedrock is at a depth of 34 inches.

Included with this soil in mapping are small areas of Arnot, Mardin, and Volusia soils. Also included are a few areas of moderately deep, moderately well drained soils that are similar to Lordstown soils. Inclusions make up as much as 15 percent of the mapped acreage.

This Lordstown soil has moderate permeability and moderate available water capacity. Surface runoff is rapid. The surface layer is 15 to 35 percent coarse fragments. In unlimed areas this soil is medium acid to very strongly acid throughout. Rooting depth is restricted by the bedrock.

Many areas of this soil are used for cultivated crops, and many are used for pasture. A few areas are used for woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is severe. Use of crop residue, stripcropping, crop rotation, minimum tillage, and diversions reduce runoff and control erosion. Bedrock may hinder the construction of diversions.

The chief management needs for pasture are proper stocking rates to maintain key plant species, pasture rotation, and periodic applications of nutrients.

Productivity of trees is moderately high. Management problems are few. Machine planting is practical.

The moderate depth to bedrock seriously limits use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses. Control of erosion and sedimentation are needed in areas disturbed for construction.

This soil is in capability subclass IIIe and woodland group 3o.

LoD—Lordstown channery silt loam, 15 to 25 percent slopes. This moderately steep, moderately deep, well drained soil is on upper convex hillsides. The areas are long and narrow and range from 5 to 125 acres. Small areas of rock outcrops occur throughout the unit.

Typically, the surface layer is dark grayish brown channery silt loam about 7 inches thick. The subsoil extends to a depth of 31 inches and is light olive brown channery silt loam. The substratum is light yellowish brown channery silt loam. Olive gray shale bedrock is at a depth of 34 inches.

Included with this soil in mapping are small areas of Arnot and Mardin soils. Also included are small areas of soils that are similar to Lordstown soils but that have more than 35 percent coarse fragments in the subsoil. Inclusions make up as much as 20 percent of the mapped acreage.

This Lordstown soil has moderate permeability and moderate available water capacity. Surface runoff is very rapid. The surface layer is 15 to 35 percent coarse fragments. In unlimed areas this soil is medium acid to very strongly acid throughout. Rooting depth is restricted by the bedrock.

Many areas of this soil are used for hayland, and a few are used for cultivated crops. Many areas are used for pasture, and many are used for woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is very severe. In some areas stripcropping, crop rotation, minimum tillage, and diversions reduce runoff and control erosion. Where slope exceeds 20 percent, use of machinery may be hazardous. Coarse fragments may interfere with seeding, applying nutrients, and harvesting. Bedrock may hinder construction of diversions.

The chief managment needs for pasture are periodic applications of nutrients, proper stocking rates to maintain key plant species, pasture rotation, and restricted use of heavy machinery.

Productivity of trees is moderately high. Slope moderately limits use of equipment. Careful machine planting is practical.

The moderate depth to bedrock and moderately steep slopes seriously limit use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses. Slope seriously limits landscaping. Control of erosion and sedimentation are needed in areas disturbed for construction.

This soil is in capability subclass IVe and woodland group 3r.

LpB—Lordstown very stony silt loam, 3 to 8 percent slopes. This gently sloping, moderately deep, well drained soil is on knolls and ridgetops. Areas are elongated on ridgetops and rounded on knolls. They range from 5 to 65 acres. Small areas of rock outcrops occur throughout the unit.

Typically, the surface layer is dark grayish brown channery silt loam about 7 inches thick. The subsoil extends to a depth of 31 inches and is light olive brown channery silt loam. The substratum is light yellowish brown channery silt loam. Olive gray shale bedrock is at a depth of 34 inches.

Included with this soil in mapping are small areas of Arnot and Mardin soils. Also included are small areas of moderately deep soils that are similar to Lordstown soils but that have more than 35 percent coarse fragments in the subsoil. Inclusions make up as much as 20 percent of the mapped acreage.

This Lordstown soil has moderate permeability and moderate available water capacity. Surface runoff is medium. Stones and boulders cover 3 to 15 percent of the surface. In unlimed areas this soil is medium acid to very strongly acid throughout. Rooting depth is restricted by the bedrock.

Most areas of this soil are used for woodland. A few areas are in pasture. The rest are being developed for urban uses.

No areas of this soil are cultivated. This soil is too stony for cultivated crops and pasture, and removing the stones and trees is usually not feasible.

Productivity of trees is moderately high. Management problems are few. Machine planting is limited by the large stones.

Most nonfarm uses are limited by the moderate depth to bedrock and large surface stones. Depth to bedrock seriously limits use for onsite waste disposal and houses with subsurface basements. The stones seriously limit landscaping. Control of erosion and sedimentation are needed in areas disturbed for construction.

This soil is in capability subclass VIs and woodland group 3o.

LpD—Lordstown very stony silt loam, 8 to 25 percent slopes. This sloping and moderately steep, moderately deep, well drained soil is on knolls, convex hillsides, and ridgetops. Areas are elongated on hillsides and ridgetops and rounded on knolls. They range from 5 to 500 acres. Small areas of rock outcrops occur throughout the unit.

Typically, the surface layer is dark grayish brown channery silt loam about 7 inches thick. The subsoil extends to a depth of 31 inches and is light olive brown channery silt loam. The substratum is light yellowish brown channery silt loam. Olive gray shale and siltstone bedrock is at a depth of 34 inches.

Included with this soil in mapping are small areas of Arnot and Mardin soils. Also included are small areas of moderately deep soils that are similar to Lordstown soils but that have more than 35 percent coarse fragments in the subsoil. Inclusions make up as much as 20 percent of the mapped acreage.

This Lordstown soil has moderate permeability and moderate available water capacity. Surface runoff is rapid and very rapid. Stones and boulders cover 3 to 15 percent of the surface. In unlimed areas this soil is medium acid to very strongly acid throughout. Rooting depth is restricted by the bedrock.

Most areas of this soil are used for woodland. A few areas are in pasture. The rest are being developed for urban uses.

No areas of this soil are cultivated. This soil is too stony for cultivated crops and pasture, and removing the stones and trees is usually not feasible.

Productivity of trees is moderately high. Slope moderately limits use of equipment. Machine planting is limited by the large stones.

Most nonfarm uses are limited by the moderate depth to bedrock, large surface stones, and sloping and moderately steep slopes. Depth to bedrock and slope seriously limit use for onsite waste disposal and houses with subsurface basements. The stones and slope seriously limit landscaping. Control of erosion and sedimentation are needed in areas disturbed for construction.

This soil is in capability subclass VIs and woodland group 3r.

MaB—Mardin channery silt loam, 3 to 8 percent slopes. This gently sloping, moderately well drained soil is on convex hilltops. The areas are elongated to rounded and range from 5 to 60 acres.

Typically, the surface layer is dark brown channery silt loam about 8 inches thick. The subsoil extends to a depth of 57 inches. The upper 8 inches of the subsoil is light olive brown and yellowish brown channery silt loam; the next 4 inches is brown, mottled channery silt loam; and the lower 37 inches is a fragipan of mottled dark yellowish brown and olive brown channery silt loam. The substratum is mottled, olive brown channery silt loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Volusia and Lordstown soils. Also included are a few areas of nearly level Mardin soils and a deep, well drained soil that is similar to Mardin soils but that has the fragipan at a depth of more than 26 inches. Inclusions make up as much as 15 percent of the mapped acreage.

This Mardin soil has slow and very slow permeability. The available water capacity is low to moderate. Surface runoff is medium. The surface layer is 15 to 35 percent coarse fragments. In unlimed areas the surface layer and upper part of the subsoil are very strongly acid to slightly acid, the lower part of the subsoil is very strongly acid to neutral, and the substratum is strongly acid to mildly alkaline. A seasonal high water table is at a depth of 18 to 24 inches during wet periods. Rooting depth is restricted by the fragipan and the seasonal high water table.

Most areas of this soil are used for cultivated crops. Many areas are used for pasture and a few for woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is moderate. Use of crop residue, stripcropping, crop rotation, and minimum tillage reduce runoff and control erosion. Diversions and subsurface drains remove excess water and allow timely tillage.

The chief management needs for pasture are proper stocking rates to maintain key plant species, pasture rotation, and periodic applications of nutrients.

Productivity of trees is moderately high. Management problems are few. Use of equipment may be temporarily limited during wet periods by the seasonal high water table. Machine planting is practical.

The slow and very slow permeability and the seasonal high water table seriously limit use for onsite waste disposal, houses with subsurface basements, and many other nonfarm uses. Control of erosion and sedimentation is needed on areas disturbed for construction.

This soil is in capability subclass IIw and woodland group 3o.

MaC—Mardin channery silt loam, 8 to 15 percent slopes. This sloping, moderately well drained soil is on

convex hilltops and upper and middle hillsides. The areas are elongated to rounded and range from 5 to 60 acres.

Typically, the surface layer is dark brown channery silt loam about 8 inches thick. The subsoil extends to a depth of 57 inches. The upper 8 inches of the subsoil is light olive brown and yellowish brown channery silt loam; the next 4 inches is brown, mottled channery silt loam; and the lower 37 inches is a fragipan of mottled dark yellowish brown and olive brown channery silt loam. The substratum is mottled, olive brown channery silt loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Volusia and Lordstown soils. Also included are a few areas of a deep, well drained soil that is similar to Mardin soils but that has the fragipan at a depth of more than 26 inches. Inclusions make up as much as 10 percent of the mapped acreage.

This Mardin soil has slow and very slow permeability. The available water capacity is low to moderate. Surface runoff is rapid. The surface layer is 15 to 35 percent coarse fragments. In unlimed areas the surface layer and upper part of the subsoil are very strongly acid to slightly acid, the lower part of the subsoil is very strongly acid to neutral, and the substratum is strongly acid to mildly alkaline. A seasonal high water table is at a depth of 8 to 24 inches during wet periods. Rooting depth is restricted by the fragipan and the seasonal high water table.

Most areas of this soil are used for cultivated crops. Many areas are used for pasture and a few for woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is severe. Use of crop residue, stripcropping, crop rotation, and minimum tillage reduce runoff and control erosion. Diversions and subsurface drains remove excess water and allow timely tillage.

The chief management needs for pasture are proper stocking rates to maintain key plant species, pasture rotation, and periodic applications of nutrients.

Productivity of trees is moderately high. Management problems are few. Use of equipment may be temporarily limited during wet periods by the seasonal high water table. Machine planting is practical.

The slow and very slow permeability and the seasonal high water table seriously limit use for onsite waste disposal, houses with subsurface basements, and many other nonfarm uses. Control of erosion and sedimentation is needed on areas disturbed for construction.

This soil is in capability subclass IIIe and woodland group 3o.

MaD—Mardin channery silt loam, 15 to 25 percent slopes. This moderately steep, moderately well drained soil is on upper and middle hillsides. The areas are elongated and range from 5 to 70 acres.

Typically, the surface layer is dark brown channery silt loam about 8 inches thick. The subsoil extends to a depth of 57 inches. The upper 8 inches of the subsoil is light olive brown and yellowish brown channery silt loam; the next 4 inches is brown, mottled channery silt loam; and the lower 37 inches is a fragipan of mottled dark yellowish brown and olive brown channery silt loam. The substratum is mottled, olive brown channery silt loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Volusia and Lordstown soils. Also included are a few areas of a deep, well drained soil that is similar to Mardin soils but that has the fragipan at a depth of more than 26 inches and a few areas of soils that have a few stones on the surface. Inclusions make up as much as 20 percent of the mapped acreage.

This Mardin soil has slow and very slow permeability. The available water capacity is low to moderate. Surface runoff is very rapid. The surface layer is 15 to 35 percent coarse fragments. In unlimed areas the surface layer and upper part of the subsoil are very strongly acid to slightly acid, the lower part of the subsoil is very strongly acid to neutral, and the substratum is strongly acid to mildly alkaline. A seasonal high water table is at a depth of 18 to 24 inches during wet periods. Rooting depth is restricted by the fragipan and the seasonal high water table.

Many areas of this soil are used for hay and a few are used for cultivated crops. Many areas are used for pasture or woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is severe. In most areas stripcropping, crop rotation, cover crops, minimum tillage, and diversions reduce runoff and control erosion. Use of machinery may be a problem on slopes of more than 20 percent. The coarse fragments may interfere with seeding, applying nutrients, and harvesting hay.

The chief management needs for pasture are periodic applications of nutrients, proper stocking rates to maintain key plant species, and pasture rotation.

Productivity of trees is moderately high. The slope limits equipment use. Use of equipment may also be temporarily limited during wet periods by the seasonal high water table.

The moderately steep slope, slow and very slow permeability, and seasonal high water table seriously limit use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses. Slope also seriously limits landscaping. Control of erosion and sedimentation is needed on areas disturbed for construction.

This soil is in capability subclass IVe and woodland group 3r.

MbB—Mardin very stony silt loam, 3 to 8 percent slopes. This gently sloping, moderately well drained soil is on convex hilltops. The areas are elongated to rounded and range from 5 to 50 acres.

Typically, the surface layer is brown channery silt loam about 8 inches thick. The subsoil extends to a depth of

57 inches. The upper 8 inches of the subsoil is light olive brown and yellowish brown channery silt loam; the next 4 inches is brown, mottled channery silt loam; and the lower 37 inches is a fragipan of mottled dark yellowish brown and olive brown channery silt loam. The substratum is mottled, olive brown channery silt loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Volusia and Lordstown soils. Also included are a few areas of a deep, well drained soil that is similar to Mardin soils but that has the fragipan at a depth of more than 26 inches. Inclusions make up as much as 15 percent of the mapped acreage.

This Mardin soil has slow and very slow permeability. The available water capacity is low to moderate. Surface runoff is medium. Stones and boulders cover 3 to 15 percent of the surface. In unlimed areas the surface layer and upper part of the subsoil are very strongly acid to slightly acid, the lower part of the subsoil is very strongly acid to neutral, and the substratum is strongly acid to mildly alkaline. A seasonal high water table is at a depth of 18 to 24 inches during wet periods. Rooting depth is restricted by the fragipan and the seasonal high water table.

Most areas of this soil are used for woodland. A few areas are used for pasture. The rest are being developed for urban uses.

No areas of this soil are cultivated. This soil is too stony for crops and pasture, and removing the stones and trees is usually not feasible.

Productivity of trees is moderately high. Management problems are few. Use of equipment may be temporarily limited during wet periods by the seasonal high water table. The stones may interfere with machine planting.

Most nonfarm uses are limited by large stones on the surface, the seasonal high water table, and slow and very slow permeability. Permeability and the water table seriously limit use for onsite waste disposal and houses with subsurface basements. Control of erosion and sedimentation are needed on areas disturbed for construction.

This soil is in capability subclass VIs and woodland group 3o.

MbD—Mardin very stony silt loam, 8 to 25 percent slopes. This sloping and moderately steep, moderately well drained soil is on convex hilltops and upper and middle hillsides. The areas are elongated to rounded and range from 5 to 60 acres.

Typically, the surface layer is brown channery silt loam about 8 inches thick. The subsoil extends to a depth of 57 inches. The upper 10 inches of the subsoil is light olive brown and yellowish brown channery silt loam; the next 2 inches is brown, mottled channery silt loam; and the lower 37 inches is a fragipan of mottled dark yellowish brown and olive brown channery silt loam. The substratum is mottled, olive brown channery silt loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Volusia and Lordstown soils. Also included are a few areas of a deep, well drained soil that is similar to Mardin soils but that has the fragipan at a depth of more than 26 inches. Inclusions make up as much as 15 percent of the mapped acreage.

This Mardin soil has slow and very slow permeability. The available water capacity is low to moderate. Surface runoff is rapid and very rapid. Stones and boulders cover 3 to 15 percent of the surface. In unlimed areas the surface layer and upper part of the subsoil are very strongly acid to slightly acid, the lower part of the subsoil is very strongly acid to neutral, and the substratum is strongly acid to mildly alkaline. A seasonal high water table is at a depth of 18 to 24 inches during wet periods. Rooting depth is restricted by the fragipan and the seasonal high water table.

Most areas of this soil are used for woodland. A few areas are used for pasture. The rest are being developed for urban uses.

No areas of this soil are cultivated. This soil is too stony for crops and pasture, and removing the stones and trees is usually not feasible.

Productivity of trees is moderately high. Slope limits use of equipment. Use of equipment may also be temporarily limited during wet periods by the seasonal high water table. The stones may interfere with machine planting.

Most nonfarm uses are limited by the moderately steep slope, large stones on the surface, seasonal high water table, and slow and very slow permeability. Slope, permeability, and the water table seriously limit use for onsite waste disposal and houses with subsurface basements. Stones and slope limit landscaping. Control of erosion and sedimentation is needed on areas disturbed for construction.

This soil is in capability subclass VIs and woodland group 3r.

Md—Medisaprists, ponded. These nearly level, deep, very poorly drained organic soils are in upland depressions, on low flood plains, and on lakebeds. They developed in almost completely decomposed shrubs and mosses. They are underlain at a depth of 16 to 51 inches or more by loamy glacial till, clayey lakebed deposits, or bedrock. The areas are rounded to elongated and range from 5 to 150 acres.

These soils are quite variable but generally have a layer of black to reddish brown highly decomposed organic material 16 to 51 inches or more thick. The lower part of this layer may contain woody fragments. Below the organic material is glacial till, lakebed sediment, or bedrock. The till and sediment are dark gray to light gray sandy loam to light silty clay loam.

Included with these soils in mapping are small areas of Holly, Canadice, Chippewa, and Norwich soils. Also included are small areas of Aquepts. Inclusions make up as much as 20 percent of the mapped acreage.

Medisaprists have moderately rapid permeability. The available water capacity is very high. Surface runoff is very slow or ponded. The water table is at or above the surface most of the year. Rooting depth is restricted by the high water table.

These soils are commonly ponded and are mostly in swamps of poor quality trees, bushes, and marsh grasses. They are favorite areas for beavers to build dams. These soils are usually left idle, although a few areas are used for cultivated crops.

Few areas of these soils are used for woodland or pasture. The high water table prevents growth of desirable forage plants and the soil is too unstable to withstand cattle traffic or the use of heavy equipment.

No areas of these soils are being developed for urban uses. The high water table and low strength seriously limit use for onsite waste disposal and houses. Low strength seriously restricts equipment use and construction of roads.

These soils are not placed in a capability subclass or woodland group.

MoB—Morris channery silt loam, 3 to 8 percent slopes. This gently sloping, somewhat poorly drained soil is on concave hillsides and benches as well as hilltops and plateaus. The areas are elongated to rounded and range from 5 to 80 acres.

Typically, the surface layer is dark grayish brown channery silt loam about 8 inches thick. The subsoil extends to a depth of 52 inches. The upper 8 inches of the subsoil is pinkish gray silt loam with many mottles, and the lower 36 inches is a fragipan of mottled, reddish brown channery silt loam. The substratum is mottled, reddish brown channery silt loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Norwich, Wellsboro, and Holly soils. Also included are a few areas of nearly level Morris soils. Inclusions make up as much as 10 percent of the mapped acreage.

This Morris soil has slow and very slow permeability and low to moderate available water capacity. Surface runoff is medium. The surface layer is 15 to 35 percent coarse fragments. In unlimed areas the surface layer and upper part of the subsoil are very strongly acid to medium acid, and the lower part of the subsoil and the substratum are strongly acid to slightly acid. A seasonal high water table is at a depth of 6 to 12 inches during wet periods. Rooting depth is restricted by the seasonal high water table and the fragipan.

Many areas of this soil are used for cultivated crops, and many areas are used for pasture. A few areas are used for woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is moderate. Cultivation may be delayed by the seasonal high water table. Excess water causes the soil to warm slowly in spring. Diversions and subsurface drains remove excess water and allow timely tillage. Use of crop residue, stripcropping, crop rotation, and minimum tillage reduce runoff and control erosion.

The chief management needs for pasture are proper stocking rates to maintain adapted plant species, pasture rotation, periodic applications of nutrients, and restricted grazing during wet periods.

Productivity of trees is moderately high. Moderate equipment limitations, windthrow hazard, and seedling mortality are all caused by the seasonal high water table. Machine planting is practical during drier periods.

The seasonal high water table and the slow and very slow permeability seriously limit use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses. Control of erosion and sedimentation is needed in areas disturbed for construction.

This soil is in capability subclass IIIw and woodland group 3w.

MoC—Morris channery silt loam, 8 to 15 percent slopes. This sloping, somewhat poorly drained soil is on concave hillsides and benches and on hilltops and plateaus. The areas are elongated to rounded and range from 5 to 50 acres.

Typically, the surface layer is dark grayish brown channery silt loam about 8 inches thick. The subsoil extends to a depth of 52 inches. The upper 8 inches of the subsoil is pinkish gray silt loam with many mottles, and the lower 36 inches is a fragipan of mottled, reddish brown channery silt loam. The substratum is mottled, reddish brown channery silt loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Wellsboro and Oquaga soils. Inclusions make up as much as 10 percent of the mapped acreage.

This Morris soil has slow and very slow permeability and low to moderate available water capacity. Surface runoff is rapid. The surface layer is 15 to 35 percent coarse fragments. In unlimed areas the surface layer and upper part of the subsoil are very strongly acid to medium acid, and the lower part of the subsoil and the substratum are strongly acid to slightly acid. A seasonal high water table is at a depth of 6 to 12 inches during wet periods. Rooting depth is restricted by the seasonal high water table and the fragipan.

Many areas of this soil are used for cultivated crops, and many areas are used for pasture (fig. 5). A few areas are used for woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is severe. Cultivation may be delayed by the seasonal high water table. Excess water causes the soil to warm slowly in spring. Diversions and subsurface drains remove excess water and allow timely tillage. Use of crop residue, stripcropping, crop rotation, diversions, and minimum tillage reduce runoff and control erosion.

The chief management needs for pasture are proper stocking rates to maintain adapted plant species, pasture

Figure 5.—Area of Morris channery silt loam, 8 to 15 percent slopes, in a field. The fence is made of stones and flagstones removed from the soil surface.

rotation, periodic applications of nutrients, and restricted grazing during wet periods.

Productivity of trees is moderately high. Moderate equipment limitations, windthrow hazard, and seedling mortality are all caused by the seasonal high water table. Machine planting is practical during drier periods.

The seasonal high water table and the slow and very slow permeability seriously limit use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses. Control of erosion and sedimentation is needed in areas disturbed for construction.

This soil is in capability subclass IIIe and woodland group 3w.

MsB—Morris very stony silt loam, 3 to 8 percent slopes. This gently sloping, somewhat poorly drained soil is on broad concave mountaintops, benches, and plateaus and at the base of hills and mountains. The areas are elongated to rounded and range from 5 to 100 acres.

Typically, the surface layer is light reddish brown channery silt loam about 8 inches thick. The subsoil extends to a depth of 52 inches. The upper 8 inches of the subsoil is mottled reddish brown and pinkish gray channery silt loam and silt loam, and the lower 36 inches is a fragipan of mottled, reddish brown channery silt loam. The substratum is mottled, reddish brown channery silt loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Wellsboro, Norwich, and Holly soils, Aquepts, and Udifluvents. Also included are areas of nearly level Morris soils and a moderately deep, somewhat poorly drained soil that is similar to Morris soils. South of Lopez is a considerable acreage of soils that are similar to Morris soils but that have a light gray to white channery sandy loam surface layer about 6 inches thick. Inclusions make up as much as 25 percent of the mapped acreage.

This Morris soil has slow and very slow permeability and low to moderate available water capacity. Surface runoff is medium. Stones and boulders cover 3 to 15 percent of the surface. In unlimed areas the surface layer and upper part of the subsoil are very strongly acid to medium acid, and the lower part of the subsoil and substratum are strongly acid to medium acid. A seasonal high water table is at a depth of 6 to 12 inches during wet periods. Rooting depth is restricted by the seasonal high water table and the fragipan.

Most areas of this soil are used for woodland. A few areas are used for pasture. The rest are being developed for urban uses.

No areas of this soil are cultivated. This soil is too stony for cultivated crops and pasture, and removing the stones and trees is not feasible.

Productivity of trees is moderately high. Moderate equipment limitations, windthrow hazard, and seedling mortality are all caused by the seasonal high water table. Machine planting is also limited by the large stones.

Most nonfarm uses are limited by the seasonal high water table, slow and very slow permeability, and the large stones on the surface. The water table and permeability seriously limit use for onsite waste disposal and houses with subsurface basements. The stones limit landscaping. Control of erosion and sedimentation is needed in areas disturbed for construction.

This soil is in capability subclass VIIs and woodland group 3w.

MsD—Morris very stony silt loam, 8 to 25 percent slopes. This sloping and moderately steep, somewhat poorly drained soil is on the middle and lower concave parts of mountainsides and hillsides. The areas are elongated and range from 5 to 100 acres.

Typically, the surface layer is light reddish brown channery silt loam about 8 inches thick. The subsoil extends to a depth of 52 inches. The upper 8 inches of the subsoil is mottled reddish brown and pinkish gray channery silt loam and silt loam, and the lower 36 inches is a fragipan of mottled, reddish brown channery silt loam. The substratum is mottled, reddish brown channery silt loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Wellsboro and Oquaga soils and a moderately deep, somewhat poorly drained soil that is similar to Morris soils. South of Lopez is a considerable acreage of soils that are similar to Morris soils but that have a light gray to white channery sandy loam surface layer about 6 inches thick. Inclusions make up as much as 25 percent of the mapped acreage.

This Morris soil has slow and very slow permeability and low to moderate available water capacity. Surface runoff is rapid and very rapid. Stones and boulders cover 3 to 15 percent of the surface. In unlimed areas the surface layer and upper part of the subsoil are very strongly to medium acid, and the lower part of the subsoil and the substratum are strongly acid to slightly acid. A seasonal high water table is at a depth of 6 to 12 inches during wet periods. Rooting depth is restricted by the seasonal high water table and the fragipan.

Most areas of this soil are used for woodland. A few areas are used for pasture. The rest are being developed for urban uses.

No areas of this soil are cultivated. This soil is too stony for cultivated crops and pasture, and removing the stones and trees is not feasible.

Productivity of trees is moderately high. Slope and the seasonal high water table moderately limit use of equipment. Moderate windthrow hazard and seedling mortality are caused by the seasonal high water table. Machine planting is limited by the large stones.

Most nonfarm uses are limited by the seasonal high water table, slow and very slow permeability, large stones on the surface, and moderately steep slope. The water table, permeability, and slope seriously limit use for onsite waste disposal and houses with subsurface basements. The stones and slope limit landscaping. Control of erosion and sedimentation is needed in areas disturbed for construction.

This soil is in capability subclass VIIs and woodland group 3w.

NoB—Norwich very stony silt loam, 0 to 8 percent slopes. This nearly level and gently sloping, very poorly drained and poorly drained soil is in mountaintop depressions, at the head of drainageways, and at the edges of narrow flood plains. The areas are rounded to elongated and range from 5 to 100 acres.

Typically, the surface layer is black channery silt loam 4 inches thick. The subsurface layer extends to a depth of 20 inches and is light gray and pinkish gray channery silt loam and channery loam. The subsoil extends to a depth of 53 inches and is a fragipan of mottled reddish gray and reddish brown channery loam. The substratum is mottled, reddish brown channery loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Morris and Holly soils, Medisaprists and Aquepts, extremely stony Norwich soils, and very stony Chippewa soils. Also included are areas of moderately deep and deep, very strongly acid and extremely acid soils that are sandy loam and loamy sand throughout the surface layer and subsoil. Inclusions make up as much as 25 percent of the mapped acreage.

This Norwich soil has slow and very slow permeability and low to moderate available water capacity. Surface runoff is slow to ponded. Stones and boulders cover 3 to 15 percent of the surface. In unlimed areas this soil is strongly acid to medium acid above the fragipan and strongly acid to slightly acid in the fragipan and substratum. A high water table is at a depth of 0 to 6 inches during wet periods and surface ponding is common. Rooting depth is restricted by the high water table.

Most areas of this soil are used for woodland. A few areas are used for pasture. The rest are being developed for urban uses.

No areas of this soil are cultivated. This soil is too stony and too wet for cultivated crops and pasture, and removing the stones and trees and draining the soil are not feasible.

Productivity of trees is low. Severe equipment limitations, windthrow hazard, and seedling mortality are all caused by the high water table. Machine planting is also limited by stones and wetness.

The high water table, stones, slow and very slow permeability, and slow runoff seriously limit use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses.

This soil is in capability subclass VIIs and woodland group 5w.

OcF—Ochrepts-Rock outcrop complex, steep. This complex consists of moderately steep to very steep, moderately well drained to excessively drained soils and Rock outcrop on mountainsides and hillsides. This complex is mainly in Sullivan County. These areas are narrow to elongated and range from 10 to 2,000 acres. Areas of Ochrepts and Rock outcrop are so intricately mixed that it was not practical to separate them in mapping.

Ochrepts make up about 75 percent of this complex. They are quite variable but generally have a cover of boulders and stones 2 to 8 feet thick on the surface. The boulders and stones range from 1 to 20 feet in diameter. The surface layer below the cover of rock fragments is 4 to 15 inches thick. It consists mostly of leaf litter, roots, organic matter, water, air, and less than 10 percent silt loam, loam, and sandy loam. The subsoil is 12 to 40 inches thick and has less than 30 percent soil material between the rock fragments. The substratum contains 50 to 75 percent rock fragments mixed with dark brown to yellowish brown silt loam, loam, and sandy loam.

Rock outcrop makes up about 15 percent of this unit. Generally, it consists of massive gray or reddish brown sandstone and conglomerate exposed as a cliff at the top of the delineation and in smaller, horizontal, linear areas throughout.

Included in mapping are a few areas of Arnot, Oquaga, and Lordstown soils and Dystrochrepts. Also included are a few areas of Wellsboro soils on footslopes and benches. The included soils generally have a 50- to 90-percent cover of stones and boulders and make up as much as 10 percent of the mapped acreage.

The Ochrepts have very rapid permeability and very low and low available water capacity. Stones and boulders cover about 90 to 100 percent of the surface. Surface runoff is very rapid. Rooting depth of most plants is restricted to the organic layer between the stones. In some areas tree roots are able to penetrate the loose layer of rock fragments. The layer of rock fragments on the surface is often unstable because of steep slope and freezing and thawing.

All areas of this complex are used for woodland.

No areas of this complex are used for cultivated crops or pasture. This complex is unsuitable for cultivated crops and pasture because of slope, stones, and rock outcrops.

Productivity of trees is low. Only the most drought-resistant species grow. Slope and stones interfere with most maintenance and harvesting operations. Seedling mortality is very high. Windthrow losses are common.

No areas of this complex are being developed for urban uses. Nonfarm uses are limited by slope, the large stones and rock outcrops, and very low available water capacity. The stones on the surface and moderately steep to very steep slope seriously limit use for onsite waste disposal and houses.

This complex is not placed in a capability subclass or woodland group.

OgB—Oquaga channery silt loam, 3 to 8 percent slopes. This gently sloping, well drained and somewhat excessively drained soil is on knolls, ridgetops, and mountaintops. Areas are elongated on ridgetops and rounded on knolls and mountaintops. They range from 5 to 30 acres. Small rock outcrops occur throughout the unit.

Typically, the surface layer is dark reddish brown channery silt loam about 7 inches thick. The subsoil extends to a depth of 25 inches and is reddish brown channery silt loam, channery loam, and very shaly loam. The substratum is reddish brown very shaly loam. Dusky red shale and thin-bedded sandstone bedrock is at a depth of 32 inches.

Included with this soil in mapping are small areas of Arnot, Wellsboro, and Morris soils. Also included are a few areas of a moderately deep, moderately well drained soil that is similar to Oquaga soils. Inclusions make up as much as 20 percent of the mapped acreage.

This Oquaga soil has moderate permeability and very low to moderate available water capacity. Surface runoff is medium. The surface layer is 15 to 45 percent coarse fragments. In unlimed areas this soil is very strongly acid to medium acid throughout. Rooting depth is restricted by the bedrock.

Most areas of this soil are used for cultivated crops, and many areas are used for pasture. A few areas are used for woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is moderate. Use of crop residue, stripcropping, crop rotation, and minimum tillage reduce runoff and control erosion.

The chief management needs for pasture are proper stocking rates to maintain key plant species, pasture rotation, and periodic application of nutrients.

Productivity of trees is moderately high. Management problems are few. Machine planting is practical.

The moderate depth to bedrock seriously limits use for onsite waste disposal, houses with subsurface

basements, and most other nonfarm uses. Control of erosion and sedimentation is needed in areas disturbed for construction.

This soil is in capability subclass IIe and woodland group 3o.

OgC—Oquaga channery silt loam, 8 to 15 percent slopes. This sloping, well drained and somewhat excessively drained soil is on knolls, ridgetops, upper hillsides, and mountaintops. Areas are elongated on ridgetops and upper hillsides and rounded on knolls and mountaintops. Areas range from 5 to 50 acres. Small rock outcrops occur throughout the unit.

Typically, the surface layer is dark reddish brown channery silt loam about 7 inches thick. The subsoil extends to a depth of 25 inches and is reddish brown channery silt loam, channery loam, and very shaly loam. The substratum is reddish brown very shaly loam. Dusky red shale and thin-bedded sandstone bedrock is at a depth of 32 inches.

Included with this soil in mapping are small areas of Arnot, Wellsboro, and Morris soils. Inclusions make up as much as 15 percent of the mapped acreage.

This Oquaga soil has moderate permeability and very low to moderate available water capacity. Surface runoff is rapid. The surface layer is 15 to 45 percent coarse fragments. In unlimed areas this soil is very strongly acid to medium acid throughout. Rooting depth is restricted by the bedrock.

Many areas of this soil are used for cultivated crops, and many are used for pasture (fig. 6). A few areas are used for woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is severe. Use of crop residue, stripcropping, crop rotation, minimum tillage, and diversions reduce runoff and control

Figure 6.—Pasture on Oquaga channery silt loam, 8 to 15 percent slopes. This soil is only fairly well suited to pasture because of the very low to moderate available water capacity. Arnot very channery loam, rocky, 3 to 15 percent slopes, is on the knoll in the left background.

erosion. Bedrock may hinder the construction of diversions.

The chief management needs for pasture are proper stocking rates to maintain key plant species, pasture rotation, and periodic applications of nutrients.

Productivity of trees is moderately high. Management problems are few. Machine planting is practical.

The moderate depth to bedrock seriously limits use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses. Control of erosion and sedimentation is needed in areas disturbed for construction.

This soil is in capability subclass IIIe and woodland group 3o.

OgD—Oquaga channery silt loam, 15 to 25 percent slopes. This moderately steep, well drained and somewhat excessively drained soil is on convex hillsides. The areas are long and narrow and range from 5 to 40 acres. Small rock outcrops occur throughout the unit.

Typically, the surface layer is dark reddish brown channery silt loam about 7 inches thick. The subsoil extends to a depth of 25 inches and is reddish brown channery silt loam, channery loam, and very shaly loam. The substratum is reddish brown very shaly loam. Dusky red shale and thin-bedded sandstone bedrock is at a depth of 32 inches.

Included with this soil in mapping are small areas of Arnot and Wellsboro soils. Also included are a few areas of soils that have stones covering 1 to 3 percent of the surface. Inclusions make up as much as 20 percent of the mapped acreage.

This Oquaga soil has moderate permeability and very low to moderate available water capacity. Surface runoff is very rapid. The surface layer is 15 to 45 percent coarse fragments. In unlimed areas this soil is very strongly acid to medium acid throughout. Rooting depth is restricted by the bedrock.

Many areas of this soil are used for hay or for pasture. A few areas are used for cultivated crops or for woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is very severe. In some areas stripcropping, crop rotation, minimum tillage, and diversions reduce runoff and control erosion. Where slope exceeds 20 percent, use of machinery may be hazardous. Coarse fragments may interfere with seeding, applying nutrients, and harvesting. Bedrock may hinder construction of diversions.

The chief management needs for pasture are periodic applications of nutrients, proper stocking rates to maintain key plant species, and pasture rotation.

Productivity of trees is moderately high. Slope moderately limits use of equipment.

The moderately steep slope and moderate depth to bedrock seriously limit use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses. Slope limits landscaping. Control of erosion and sedimentation are needed in areas disturbed for construction.

This soil is in capability subclass IVe and woodland group 3r.

OsB—Oquaga extremely stony silt loam, 3 to 8 percent slopes. This gently sloping, well drained and somewhat excessively drained soil is on knolls, ridgetops, and mountaintops. Areas are elongated on ridgetops and rounded on knolls and mountaintops. They range from 5 to 100 acres. Small rock outcrops occur throughout the unit.

Typically, the surface layer is dark reddish brown channery silt loam about 7 inches thick. The subsoil extends to a depth of 25 inches and is reddish brown channery silt loam, channery loam, and very shaly loam. The substratum is reddish brown very shaly loam. Dusky red shale and thin-bedded sandstone bedrock is at a depth of 32 inches.

Included with this soil in mapping are small areas of Arnot, Lordstown, and Wellsboro soils. Also included are a few areas of soils that have less than 15 percent of the surface covered by stones and boulders. Inclusions make up as much as 25 percent of the mapped acreage.

This Oquaga soil has moderate permeability and very low to moderate available water capacity. Surface runoff is medium. Stones and boulders cover 15 to 50 percent of the surface. In unlimed areas this soil is very strongly acid to medium acid throughout. Rooting depth is restricted by the bedrock.

Most areas of this soil are used for woodland. A few areas are used for pasture. The rest are being developed for urban uses.

No areas of this soil are cultivated. The soil is too stony for cultivated crops and pasture, and removing the stones and trees is not feasible.

Productivity of trees is moderately high. The stones moderately limit use of equipment. The large stones also restrict machine planting.

The moderate depth to bedrock and large surface stones seriously limit use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses. The stones and slope also seriously limit landscaping. Control of erosion and sedimentation are needed in areas disturbed for construction.

This soil is in capability subclass VIIs and woodland group 3x.

OsD—Oquaga extremely stony silt loam, 8 to 25 percent slopes. This sloping and moderately steep, well drained and somewhat excessively drained soil is on hillsides, mountainsides, and mountaintops. Areas are elongated on hillsides and mountainsides and rounded on mountaintops. They range from 5 to 150 acres. Small rock outcrops occur throughout the unit.

Typically, the surface layer is dark reddish brown channery silt loam about 7 inches thick. The subsoil extends to a depth of 25 inches and is reddish brown

channery silt loam, channery loam, and very shaly loam. The substratum is reddish brown very shaly loam. Dusky red shale and thin-bedded sandstone bedrock is at a depth of 32 inches.

Included with this soil in mapping are small areas of Arnot, Lordstown, and Wellsboro soils. Also included are a few areas of soils that have less than 15 percent of the surface covered by stones and boulders. Inclusions make up as much as 25 percent of the acreage mapped.

This Oquaga soil has moderate permeability and very low to moderate available water capacity. Surface runoff is rapid and very rapid. Stones and boulders cover 15 to 50 percent of the surface. In unlimed areas this soil is very strongly acid to medium acid throughout. Rooting depth is restricted by the bedrock.

Most areas of this soil are used for woodland. A few areas are used for pasture. The rest are being developed for urban uses.

No areas of this soil are cultivated. This soil is too stony for cultivated crops and pasture, and removing the stones and trees is not feasible.

Productivity of trees is moderately high. The stones and slope moderately limit use of equipment. The large stones also restrict machine planting.

The moderate depth to bedrock, large surface stones, and moderately steep slopes seriously limit use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses. The stones and slope also seriously limit landscaping. Control of erosion and sedimentation are needed in areas disturbed for construction.

This soil is in capability subclass VIs and woodland group 3x.

Po—Pope soils. These nearly level, well drained soils are on flood plains, usually adjacent to the larger stream channels. The surface layer is silt loam in some areas and loam or fine sandy loam in others. The areas are long and narrow and range from 5 to 100 acres. These soils are occasionally flooded.

Typically, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil extends to a depth of 40 inches and is brown and dark brown loam and sandy loam. The substratum is stratified dark brown and pale brown loamy sand and sandy loam to a depth of 60 inches.

Included with these soils in mapping are small areas of Holly, Alton, and Chenango soils and Udifluvents. Also included are a few areas of a deep, moderately well drained soil that is similar to Pope soils. Inclusions make up as much as 15 percent of the mapped acreage.

These Pope soils have moderate and moderately rapid permeability and moderate to high available water capacity. Surface runoff is slow. In unlimed areas these soils are strongly acid and very strongly acid throughout.

Most areas of these soils are used for cultivated crops (fig. 7). A few areas are used for pasture or for woodland. The rest are being developed for urban uses.

If these soils are cultivated, the erosion hazard is slight. Cover crops, crop rotation, and use of crop residue help maintain organic matter content and good tilth and help control scouring during floods.

The chief management needs for pasture are proper stocking rates to maintain key plant species, pasture rotation, and periodic applications of nutrients.

Productivity of trees is high. Management problems are few. Machine planting is practical.

The occasional flooding seriously limits use for onsite waste disposal, houses, and many other nonfarm uses.

These soils are in capability class I and woodland group 2o.

ReA—Rexford silt loam, 0 to 3 percent slopes. This nearly level, somewhat poorly drained and poorly drained soil is on stream terraces along major and secondary streams. The areas are elongated and range from 5 to 35 acres.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil extends to a depth of 42 inches. The upper 10 inches of the subsoil is mottled, yellowish brown and grayish brown silt loam, and the lower 24 inches is a fragipan of mottled, dark brown gravelly loam. The substratum is mottled, reddish brown gravelly sandy loam to a depth of 60 inches.

Included with this soil in mapping are areas of Braceville, Holly, and Canadice soils. Also included are a few areas that are flooded or ponded during wet seasons, and areas of soils that are similar to Rexford soils but that have a reddish brown subsoil. Inclusions make up as much as 25 percent of the mapped acreage.

This Rexford soil has slow permeability. The available water capacity is moderate. Surface runoff is slow. In unlimed areas the surface layer and upper part of the subsoil are strongly acid and medium acid, and the lower part of the subsoil and the substratum are strongly acid to slightly acid. A high water table is at a depth of 0 to 18 inches during wet periods, and surface ponding is common. Rooting depth is restricted by the high water table and the fragipan.

Many areas of this soil are used for cultivated crops, and many areas are used for pasture. A few areas are used for woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is slight. Cultivation may be delayed by the high water table. Excess water causes the soil to warm slowly in spring. Surface and subsurface drains remove excess water and allow timely tillage. Cover crops, crop rotation, and use of crop residue help maintain organic matter content and good tilth.

The chief management needs for pasture are proper stocking rates to maintain adapted plant species, pasture rotation, periodic applications of nutrients, and restricted grazing during wet periods.

Productivity of trees is moderately high. Moderate equipment limitations, windthrow hazard, and seedling

mortality are all caused by the high water table. Machine planting is practical during drier periods.

The high water table and slow permeability seriously limit use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses. The flooding or ponding in a few areas are also limitations.

This soil is in capability subclass IIIw and woodland group 3w.

ReB—Rexford silt loam, 3 to 8 percent slopes. This gently sloping, somewhat poorly drained and poorly drained soil is on stream terraces and terraces on valley sides. These terraces are along major and secondary streams. The areas are elongated and range from 5 to 60 acres.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil extends to a depth of 42 inches. The upper 10 inches of the subsoil is mottled yellowish brown and grayish brown silt loam, and the lower 24 inches is a fragipan of mottled, dark brown gravelly loam. The substratum is mottled, reddish brown gravelly sandy loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Braceville, Holly, and Canadice soils. Also included are a few areas of soils that are similar to Rexford soils but that have a reddish brown subsoil. Inclusions make up as much as 20 percent of the mapped acreage.

This Rexford soil has slow permeability. The available water capacity is moderate. Surface runoff is medium. In unlimed areas the surface layer and upper part of the subsoil are strongly acid and medium acid, and the lower part of the subsoil and the substratum are strongly acid to slightly acid. A high water table is at a depth of 0 to 18 inches during wet periods. Rooting depth is restricted by the high water table and the fragipan.

Many areas of this soil are used for cultivated crops, and many are used for pasture. A few areas are used for woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is moderate. Cultivation may be delayed by the high water table. Excess water causes the soil to warm slowly in spring. Diversions and subsurface drains remove excess water and allow timely tillage. Use of crop residue, stripcropping, crop rotation, and minimum tillage reduce runoff and control erosion.

The chief management needs for pasture are proper stocking rates to maintain adapted plant species, pasture rotation, periodic applications of nutrients, and restricted grazing during wet periods.

Figure 7.—Good stand of alfalfa on Pope soils.

Productivity of trees is moderately high. Moderate equipment limitations, windthrow hazard, and seedling mortality are all caused by the high water table. Machine planting is practical during drier periods.

The high water table and slow permeability seriously limit use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses. Control of erosion and sedimentation are needed in areas disturbed for construction.

This soil is in capability subclass IIIw and woodland group 3w.

ReC—Rexford silt loam, 8 to 12 percent slopes. This sloping, somewhat poorly drained and poorly drained soil is on terraces on valley sides. These terraces are along major and secondary streams. The areas are elongated and range from 5 to 50 acres.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil extends to a depth of 42 inches. The upper 10 inches of the subsoil is mottled yellowish brown and grayish brown silt loam, and the lower 24 inches is a fragipan of mottled, dark brown gravelly loam. The substratum is mottled, reddish brown gravelly sandy loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Braceville and Volusia soils. Also included are a few areas of soils that are less acid in the subsoil and soils that are underlain by either poorly sorted glacial till or lakebed deposits. Inclusions make up as much as 25 percent of the mapped acreage.

This Rexford soil has slow permeability. The available water capacity is moderate. Surface runoff is rapid. In unlimed areas the surface layer and upper part of the subsoil are strongly acid and medium acid, and the lower part of the subsoil and the substratum are strongly acid to slightly acid. A high water table is at a depth of 0 to 18 inches during wet periods. Rooting depth is restricted by the seasonal high water table and the fragipan.

Many areas of this soil are used for cultivated crops, and many are used for pasture. A few areas are used for woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is severe. Cultivation may be delayed by the seasonal high water table. Excess water causes the soil to warm slowly in spring. Diversions and subsurface drains remove excess water and allow timely tillage. Use of crop residue, stripcropping, crop rotation, diversions, and minimum tillage reduce runoff and control erosion.

The chief management needs for pasture are proper stocking rates to maintain adapted plant species, pasture rotation, periodic applications of nutrients, and restricted grazing during wet periods.

Productivity of trees is moderately high. Moderate equipment limitations, windthrow hazard, and seedling mortality are all caused by the high water table. Machine planting is practical during drier periods.

The seasonal high water table and slow permeability seriously limit use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses. Control of erosion and sedimentation are needed in areas disturbed for construction.

This soil is in capability subclass IIIe and woodland group 3w.

Uc—Udifluvents, cobbly. These nearly level, somewhat poorly drained to excessively drained soils are on dissected flood plains. They formed in recent stratified cobbly, gravelly, and stony alluvium adjacent to streams. The areas are long and wavy and range from 10 to 100 acres. These soils are flooded frequently, and the positions of the main and secondary stream channels are constantly changing. These soils have very little soil development because of the frequent deposition and erosion of soil material.

Udifluvents are quite variable but generally have a surface layer of very dark brown to reddish brown cobbly loam to very coarse sand 0 to 10 inches thick. The substratum is dark brown to yellowish brown very gravelly loam to very coarse sand to a depth of 60 inches or more.

Included with these soils in mapping are small areas of Wyoming, Chenango, Linden, Pope, and Holly soils. Inclusions make up as much as 20 percent of the mapped acreage.

Udifluvents have very rapid to moderate permeability. Available water capacity is very low and low. Gravel and cobblestones make up 0 to 80 percent of individual layers. In unlimed areas these soils are very strongly acid to medium acid throughout.

These soils are used mainly for woodland. A few areas are used for pasture and crops.

The suitability of these soils for cultivated crops is very poor because of the frequent flooding, very low to low available water capacity, and coarse fragments. Suitability for pasture and woodland is poor because of the very low to low available water capacity and frequent flooding. Planting suitable shrubs and grasses helps stabilize streambanks. Frequent flooding seriously limits most nonfarm uses of these soils.

These soils are not placed in a capability subclass or woodland group.

Ud—Udorthents, very channery. These nearly level to very steep, moderately well drained to excessively drained soils are on man-made slopes formed during coal stripping operations on mountaintops and plateaus. These soils formed in material that resulted from mixing the overburden of glacial till with underlying sandstone and shale broken up during removal of the coal. The areas are rounded to narrow and wavy and range from 25 to 500 acres.

Udorthents are quite variable. The surface layer is 0 to 10 inches of very dark grayish brown to yellowish brown very channery loamy sand to silty clay loam. The substratum is olive gray to very dusky red very channery silty clay loam to loamy sand.

Included with these soils in mapping are small areas of Oquaga, Wellsboro, Morris, and Norwich soils. The headwall of the stripping operation, consisting of a rock cliff, is also included. Inclusions make up as much as 15 percent of the mapped acreage.

Udorthents have very rapid to slow permeability. The available water capacity is very low to moderate. Surface runoff is slow to very rapid. Coarse fragments make up 40 to 100 percent of individual layers between the surface and a depth of 60 inches. In unlimed areas reaction is extremely acid to neutral throughout.

In the past these soils were left idle. Aspen, black birch, and goldenrod grew in the gently sloping areas. The steeper areas remained barren and underwent very severe erosion. The areas are now being rounded off to approximate the original contour of the land and planted to evergreens or grasses for woodland or recreation.

If cultivated crops are grown, the erosion hazard is moderate to severe. In some areas large amounts of lime are needed. Flagstones and stones must be removed from the surface. Large additions of organic matter to the plow layer are needed to improve the available water capacity. Careful soil testing is needed to determine nutrient requirements.

The chief management needs for pasture are sufficient applications of nutrients and lime, proper stocking rates to maintain adapted plant species, and pasture rotation.

Trees to be grown should be able to stand seasonal drought. Seedling mortality is serious in many areas. Stones and coarse fragments and slope interfere with machine planting in some areas.

Urban development is limited by the coarse fragments and stones, slow permeability or very rapid permeability, and moderately steep to very steep slope. The permeability and slope seriously limit use for onsite waste disposal. Coarse fragments, and stones seriously limit landscaping. Buildings may be damaged if the underlying materal is not adequately compacted.

These soils are not placed in a capability subclass or woodland group.

UnB—Unadilla silt loam, 3 to 8 percent slopes. This gently sloping, well drained soil is on stream terraces near major streams in Bradford County. The areas are rounded to elongated and range from 5 to 75 acres.

Typically, the surface layer is dark brown silt loam about 10 inches thick. The subsoil extends to a depth of 36 inches. The upper 18 inches of the subsoil is yellowish brown very fine sandy loam, and the lower 8 inches is dark yellowish brown silt loam. The substratum is mottled light yellowish brown very fine sandy loam to a depth of 55 inches and mottled, light olive brown channery loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Alton, Chenango, Braceville, and Rexford soils. Also included are a few areas of nearly level Unadilla soils. Inclusions make up as much as 15 percent of the mapped acreage.

This Unadilla soil has moderate permeability and high available water capacity. Surface runoff is medium. In unlimed areas the surface layer and subsoil are very strongly acid to medium acid, and the substratum is strongly acid to mildly alkaline.

Most areas of this soil are used for cultivated crops. A few areas are used for pasture or for woodland. The rest are being developed for urban uses.

If this soil is cultivated, the erosion hazard is moderate. Cover crops, crop rotation, and use of crop residue and manure help maintain organic matter content and good tilth. Minimum tillage, diversions, stripcropping, and cover crops reduce runoff and control erosion.

The chief management needs for pasture are proper stocking rates to maintain key plant species, pasture rotation, and periodic applications of nutrients.

Productivity of trees is high. Management problems are few. Machine planting is practical.

The moderately rapid to rapid permeability in the substratum seriously limits use for onsite waste disposal and some other nonfarm uses. Control of erosion is needed in areas disturbed for construction.

This soil is in capability subclass IIe and woodland group 2o.

UnC—Unadilla silt loam, 8 to 15 percent slopes. This sloping, well drained soil is on uplands and stream terraces near major streams in Bradford County. The areas are elongated and range from 5 to 50 acres.

Typically, the surface layer is dark brown silt loam about 10 inches thick. The subsoil extends to a depth of 36 inches. The upper 18 inches of the subsoil is yellowish brown very fine sandy loam, and the lower 8 inches is dark yellowish brown silt loam. The substratum is mottled, light yellowish brown very fine sandy loam to a depth of 55 inches and mottled, light olive brown channery loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Alton, Chenango, Mardin, Volusia, and Rexford soils. Inclusions make up as much as 20 percent of the mapped acreage.

This Unadilla soil has moderate permeability and high available water capacity. Surface runoff is rapid. In unlimed areas the surface layer and subsoil are very strongly acid to medium acid, and the substratum is strongly acid to mildly alkaline.

Most areas of this soil are used for cultivated crops. A few areas are used for pasture or for woodland. The rest are being developed for urban uses.

If this soil is cultivated, the erosion hazard is severe. Cover crops, crop rotation, use of crop residue and manure, minimum tillage, and diversions help maintain organic matter content and good tilth, reduce runoff, and control erosion.

The chief management needs for pasture are proper stocking rates to maintain key plant species, pasture rotation, and periodic applications of nutrients.

Productivity of trees is high. Erosion causes problems in management. Machine planting is practical.

Nonfarm uses are limited by the slope and moderately rapid to rapid permeability in the substratum. The permeability seriously limits use for onsite waste disposal. Control of erosion is needed in areas disturbed for construction.

This soil is in capability subclass IIIe and woodland group 2r.

VoB—Volusia channery silt loam, 3 to 8 percent slopes. This gently sloping, somewhat poorly drained soil is on concave hillsides and benches and on hilltops. The areas are rounded and range from 5 to 150 acres.

Typically, the surface layer is dark grayish brown channery silt loam about 8 inches thick. The subsoil extends to a depth of 50 inches. The upper 6 inches of the subsoil is mottled, light yellowish brown and light brownish gray channery silt loam, and the lower 36 inches is a fragipan of mottled light olive brown and dark brown channery loam and channery clay loam. The substratum is mottled, olive brown channery silt loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Chippewa, Mardin, and Holly soils and a few areas of a soil that is similar to Volusia soils but that is moderately deep. Also included are a few areas of nearly level Volusia soils. Inclusions make up as much as 10 percent of the mapped acreage.

This Volusia soil has slow and very slow permeability. The available water capacity is very low and low. Surface runoff is medium. The surface layer is 15 to 30 percent coarse fragments. In unlimed areas the surface layer and upper part of the subsoil are strongly acid to slightly acid, the lower part of the subsoil is strongly acid to neutral, and the substratum is medium acid to moderately alkaline. A seasonal high water table is at a depth of 6 to 18 inches during wet periods. Rooting depth is restricted by the seasonal high water table and the fragipan.

Many areas of this soil are used for cultivated crops. Many areas are used for pasture, and a few are used for woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is moderate. Cultivation may be delayed by the seasonal high water table. Excess water causes the soil to warm slowly in spring. Diversions and subsurface drains remove excess water and allow timely tillage. Use of crop residue, stripcropping, crop rotation, and minimum tillage reduce runoff and control erosion.

The chief management needs for pasture are proper stocking rates to maintain adapted plant species, pasture rotation, periodic applications of nutrients, and restricted grazing during wet periods.

Productivity of trees is moderately high. Moderate equipment limitations, windthrow hazard, and seedling mortality are all caused by the seasonal high water table. Machine planting is practical during drier periods.

The seasonal high water table and the slow and very slow permeability seriously limit use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses. Control of erosion and sedimentation are needed in areas disturbed for construction.

This soil is in capability subclass IIIw and woodland group 3w.

VoC—Volusia channery silt loam, 8 to 15 percent slopes. This sloping, somewhat poorly drained soil is on concave hillsides and benches and on hilltops. The areas are elongated to rounded and range from 5 to 150 acres.

Typically, the surface layer is dark grayish brown channery silt loam about 8 inches thick. The subsoil extends to a depth of 50 inches. The upper 6 inches of the subsoil is mottled, light yellowish brown and light brownish gray channery silt loam, and the lower 36 inches is a mottled fragipan of light olive brown and dark brown channery loam and channery clay loam. The substratum is mottled, olive brown channery silt loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Chippewa, Mardin, and Lordstown soils and a few areas of a soil that is similar to Volusia soils but that is moderately deep. Inclusions make up as much as 10 percent of the mapped acreage.

This Volusia soil has slow and very slow permeability and very low and low available water capacity. Surface runoff is rapid. The surface layer is 15 to 30 percent coarse fragments. In unlimed areas the surface layer and upper part of the subsoil are strongly acid to slightly acid, the lower part of the subsoil is strongly acid to neutral, and the substratum is medium acid to moderately alkaline. A seasonal high water table is at a depth of 6 to 18 inches during wet periods. Rooting depth is restricted by the seasonal high water table and the fragipan.

Many areas of this soil are used for cultivated crops, and many are used for pasture. A few areas are used for woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is severe. Cultivation may be delayed by the seasonal high water table. Excess water causes the soil to warm slowly in spring. Diversions and subsurface drains remove excess water and allow timely tillage. Use of crop residue, stripcropping, crop rotation, diversions, and minimum tillage reduce runoff and control erosion.

The chief management needs for pasture are proper stocking rates to maintain adapted plant species, pasture rotation, periodic applications of nutrients, and restricted grazing during wet periods.

Productivity of trees is moderately high. Moderate equipment limitations, windthrow hazard, and seedling mortality are all caused by the seasonal high water table. Machine planting is practical during drier periods.

The seasonal high water table and the slow and very slow permeability seriously limit use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses. Control of erosion and sedimentation are needed in areas disturbed for construction.

This soil is in capability subclass IIIe and woodland group 3w.

VoD—Volusia channery silt loam, 15 to 25 percent slopes. This moderately steep, somewhat poorly drained soil is on concave hillsides. The areas are elongated and range from 5 to 70 acres.

Typically, the surface layer is dark grayish brown channery silt loam about 8 inches thick. The subsoil extends to a depth of 50 inches. The upper 6 inches of the subsoil is mottled, light yellowish brown and light brownish gray channery silt loam, and the lower 36 inches is a fragipan of mottled light olive brown and dark brown channery loam and channery clay loam. The substratum is mottled, olive brown channery silt loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Mardin and Lordstown soils and a few areas of a soil that is similar to Volusia soils but that is moderately deep. Also included are a few areas of Volusia soils that have a few stones on the surface. Inclusions make up as much as 20 percent of the mapped acreage.

This Volusia soil has slow and very slow permeability. The available water capacity is very low and low. Surface runoff is very rapid. The surface layer is 15 to 30 percent coarse fragments. In unlimed areas the surface layer and upper part of the subsoil are strongly acid to slightly acid, the lower part of the subsoil is strongly acid to neutral, and the substratum is medium acid to moderately alkaline. A seasonal high water table is at a depth of 6 to 18 inches during wet periods. Rooting depth is restricted by the seasonal high water table and the fragipan.

Many areas of this soil are used for pasture, and many are used for woodland. A few areas are used for hay or for cultivated crops. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is very severe. Cultivation may be delayed by the seasonal high water table. Excess water causes the soil to warm slowly in spring. Stripcropping, diversions, grassed waterways, and minimum tillage reduce runoff and control erosion.

The chief management needs for pasture are proper stocking rates to maintain adapted plant species, pasture rotation, periodic applications of nutrients, and restricted grazing during wet periods.

Productivity of trees is moderately high. Moderate erosion hazard, equipment limitations, windthrow hazard, and seedling mortality are all caused by the seasonal high water table and slope.

The moderately steep slope, seasonal high water table, and slow and very slow permeability seriously limit use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses. Slope seriously limits landscaping. Control of erosion and sedimentation are needed in areas disturbed for construction.

This soil is in capability subclass IVe and woodland group 3r.

VsB—Volusia very stony silt loam, 3 to 8 percent slopes. This gently sloping, somewhat poorly drained soil is on concave hillsides and benches and on hilltops. The areas are elongated to rounded and range from 5 to 20 acres.

Typically, the surface layer is dark grayish brown channery silt loam about 8 inches thick. The subsoil extends to a depth of 50 inches. The upper 6 inches of the subsoil is mottled, light yellowish brown and light brownish gray channery silt loam, and the lower 36 inches is a fragipan of mottled light olive brown and dark brown channery loam and channery clay loam. The substratum is mottled, olive brown channery silt loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Mardin, Chippewa, and Holly soils and a few areas of a soil that is similar to Volusia soils but that is moderately deep. Also included are a few areas of nearly level Volusia soils. Inclusions make up as much as 15 percent of the mapped acreage.

This Volusia soil has slow and very slow permeability. The available water capacity is very low and low. Surface runoff is medium. Stones and boulders cover 3 to 15 percent of the surface. In unlimed areas the surface layer and upper part of the subsoil are strongly acid to slightly acid, the lower part of the subsoil is strongly acid to neutral, and the substratum is medium acid to moderately alkaline. A seasonal high water table is at a depth of 6 to 18 inches during wet periods. Rooting depth is restricted by the seasonal high water table and the fragipan.

Most areas of this soil are used for woodland. A few areas are used for pasture. The rest are being developed for urban uses.

No areas of this soil are cultivated. The soil is too stony for cultivated crops and pasture, and removing the stones and trees is not feasible.

Productivity of trees is moderately high. Moderate equipment limitations, windthrow hazard, and seedling mortality are all caused by the seasonal high water table. Machine planting is also limited by the stones.

Most nonfarm uses are limited by the seasonal high water table, slow and very slow permeability, and large stones on the surface. The water table and permeability seriously limit use for onsite waste disposal and houses with subsurface basements. The stones limit landscaping. Control of erosion and sedimentation are needed on areas disturbed for construction.

This soil is in capability subclass VIIs and woodland group 3w.

VsD—Volusia very stony silt loam, 8 to 25 percent slopes. This sloping and moderately steep, somewhat poorly drained soil is on concave hillsides. The areas are elongated and range from 5 to 20 acres.

Typically, the surface layer is dark grayish brown channery silt loam about 8 inches thick. The subsoil extends to a depth of 50 inches. The upper 6 inches of the subsoil is mottled, light yellowish brown and light brownish gray channery silt loam, and the lower 36 inches is a fragipan of mottled light olive brown and dark brown channery loam and channery clay loam. The substratum is mottled, olive brown channery silt loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Mardin and Lordstown soils and a few areas of a soil that is similar to Volusia soils but that is moderately deep. Inclusions make up as much as 20 percent of the mapped acreage.

This Volusia soil has slow and very slow permeability. The available water capacity is very low and low. Surface runoff is rapid. Stones and boulders cover 3 to 15 percent of the surface. In unlimed areas the surface layer and upper part of the subsoil are strongly acid to slightly acid, the lower part of the subsoil is strongly acid to neutral, and the substratum is medium acid to moderately alkaline. A seasonal high water table is at a depth of 6 to 18 inches during wet periods. Rooting depth is restricted by the seasonal high water table and the fragipan.

Most areas of this soil are used for woodland. A few areas are used for pasture. The rest are being developed for urban uses.

No areas of this soil are cultivated. This soil is too stony for cultivated crops and pasture, and removing the stones and trees is not feasible.

Productivity of trees is moderately high. Moderate equipment limitations are caused by slope and the seasonal high water table. The seasonal high water table also causes moderate windthrow hazard and seedling mortality. Machine planting is limited by the stones.

Most nonfarm uses are limited by the seasonal high water table, slow and very slow permeability, the large stones on the surface, and sloping and moderately steep slope. The water table, permeability, and slope seriously limit use for onsite waste disposal and houses with subsurface basements. The stones and slope limit landscaping. Control of erosion and sedimentation are needed in areas disturbed for construction.

This soil is in capability subclass VIIs and woodland group 3w.

WbB—Wellsboro channery silt loam, 3 to 8 percent slopes. This gently sloping, moderately well drained and somewhat poorly drained soil is on smooth and convex hilltops and plateaus. The areas are elongated to rounded and range from 5 to 60 acres.

Typically, the surface layer is dark brown channery silt loam about 8 inches thick. The subsoil extends to a depth of 52 inches. The upper 6 inches of the subsoil is reddish brown channery silt loam; the next 6 inches is reddish brown, mottled channery silt loam; and the lower 32 inches is a fragipan of mottled, dark reddish brown channery loam. The substratum is mottled, dark reddish brown channery loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Morris and Oquaga soils. Also included are a few areas of nearly level Wellsboro soils. Inclusions make up as much as 10 percent of the mapped acreage.

This Wellsboro soil has slow permeability. The available water capacity is moderate. Surface runoff is medium. The surface layer is 15 to 35 percent coarse fragments. In unlimed areas this soil is very strongly acid to medium acid throughout. A seasonal high water table is at a depth of 12 to 36 inches during wet periods. Rooting depth is restricted by the seasonal high water table and the fragipan.

Most areas of this soil are used for cultivated crops. Many areas are used for pasture, and a few areas are used for woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is moderate. Use of crop residue, stripcropping, crop rotation, and minimum tillage reduce runoff and control erosion. Diversions and subsurface drains remove excess water and allow timely tillage.

The chief management needs for pasture are proper stocking rates to maintain key plant species, pasture rotation, periodic applications of nutrients, and restricted grazing during wet periods.

Productivity of trees is high. Management problems are few. Use of equipment may be temporarily limited during wet periods by the seasonal high water table. Machine planting is practical.

The slow permeability and seasonal high water table seriously limit use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses. Control of erosion and sedimentation are needed in areas disturbed for construction.

This soil is in capability subclass IIw and woodland group 2o.

WbC—Wellsboro channery silt loam, 8 to 15 percent slopes. This sloping, moderately well drained and somewhat poorly drained soil is on convex hilltops, upper and middle hillsides, and plateaus. The areas are elongated to rounded and range from 5 to 60 acres.

Typically, the surface layer is dark brown channery silt loam about 8 inches thick. The subsoil extends to a depth of 52 inches. The upper 6 inches of the subsoil is reddish brown channery silt loam; the next 6 inches is reddish brown, mottled channery silt loam; and the lower 32 inches is a fragipan of mottled, dark reddish brown channery loam. The substratum is mottled, dark reddish brown channery loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Morris and Oquaga soils. Inclusions make up as much as 10 percent of the mapped acreage.

This Wellsboro soil has slow permeability. The available water capacity is moderate. Surface runoff is rapid. The surface layer is 15 to 35 percent coarse fragments. In unlimed areas this soil is very strongly acid to medium acid throughout. A seasonal high water table is at a depth of 12 to 36 inches during wet periods. Rooting depth is restricted by the seasonal high water table and the fragipan.

Most areas of this soil are used for cultivated crops. Many areas are used for pasture, and a few areas are used for woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is severe. Use of crop residue, stripcropping, crop rotation, minimum tillage, and diversions reduce runoff and control erosion. Diversions and subsurface drains remove excess water and allow timely tillage.

The chief management needs for pasture are proper stocking rates to maintain key plant species, pasture rotation, periodic applications of nutrients, and restricted grazing during wet periods.

Productivity of trees is high. Management problems are few. Use of equipment may be temporarily limited during wet periods by the seasonal high water table Machine planting is practical.

The slow permeability and seasonal high water table seriously limit use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses. Control of erosion and sedimentation are needed in areas disturbed for construction.

This soil is in capability subclass IIIe and woodland group 2o.

WbD—Wellsboro channery silt loam, 15 to 25 percent slopes. This moderately steep, moderately well drained and somewhat poorly drained soil is on convex upper and middle hillsides. The areas are elongated and range from 5 to 40 acres.

Typically, the surface layer is dark brown channery silt loam about 8 inches thick. The subsoil extends to a depth of 52 inches. The upper 6 inches of the subsoil is reddish brown channery silt loam; the next 6 inches is reddish brown, mottled channery silt loam; and the lower 32 inches is a fragipan of mottled, dark reddish brown channery loam. The substratum is mottled, dark reddish brown channery loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Morris and Oquaga soils. Also included are a few areas of Wellsboro, Morris, and Oquaga soils that have a few stones on the surface. Inclusions make up as much as 20 percent of the mapped acreage.

This Wellsboro soil has slow permeability. The available water capacity is moderate. Surface runoff is very rapid. The surface layer is 15 to 35 percent coarse fragments. In unlimed areas this soil is very strongly acid to medium acid throughout. A seasonal high water table is at a depth of 12 to 36 inches during wet periods. Rooting depth is restricted by the seasonal high water table and the fragipan.

Many areas of this soil are used for hay, for pasture, or for woodland. A few areas are used for cultivated crops. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is very severe. Stripcropping, crop rotation, minimum tillage, and diversions reduce runoff and control erosion. Where slope exceeds 20 percent, use of machinery may be hazardous. Coarse fragments may interfere with seeding, applying nutrients, and harvesting.

The chief management needs for pasture are periodic applications of nutrients, proper stocking rates to maintain key plant species, pasture rotation, and restricted grazing during wet periods.

Productivity of trees is high. Slope moderately limits use of equipment. Use of equipment may also be temporarily limited during wet periods by the seasonal high water table.

The moderately steep slope, slow permeability, and seasonal high water table seriously limit use for onsite waste disposal, houses with subsurface basements, and most other nonfarm uses. Slope also seriously limits landscaping. Control of erosion and sedimentation are needed in areas disturbed for construction.

This soil is in capability subclass IVe and woodland group 2r.

WgB—Wellsboro very stony silt loam, 3 to 8 percent slopes. This gently sloping, moderately well drained and somewhat poorly drained soil is on smooth and convex mountain tops and plateaus. The areas are elongated to rounded and range from 5 to 50 acres.

Typically, the surface layer is dark brown channery silt loam about 8 inches thick. The subsoil extends to a depth of 52 inches. The upper 6 inches of the subsoil is reddish brown channery silt loam; the next 6 inches is reddish brown, mottled channery silt loam; and the lower 32 inches is a fragipan of mottled, dark reddish brown channery loam. The substratum is mottled, dark reddish brown channery loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Mardin, Morris, and Oquaga soils. Also included are areas of nearly level Wellsboro soils and a few areas of soils that have more than 15 percent stones on the surface. South of Lopez is a considerable acreage of soils that are similar to Wellsboro soils but that have a light gray to white channery sandy loam surface layer about 6 inches thick. Inclusions make up as much as 25 percent of the mapped acreage.

This Wellsboro soil has slow permeability. The available water capacity is moderate. Surface runoff is medium. Stones and boulders cover 3 to 15 percent of the surface. In unlimed areas the soil is very strongly acid to medium acid throughout. A seasonal high water table is at a depth of 12 to 36 inches during wet periods. Rooting depth is restricted by the seasonal high water table and the fragipan.

Most areas of this soil are used for woodland. A few areas are used for pasture. The rest are being developed for urban uses.

No areas of this soil are cultivated. This soil is too stony for cultivated crops and pasture, and removing the stones and trees is usually not feasible.

Productivity of trees is high. Management problems are few. Use of equipment may be temporarily limited by the seasonal high water table. Machine planting is limited by stones.

Most nonfarm uses are limited by the large stones on the surface, slow permeability, and seasonal high water table. The permeability and water table seriously limit use for onsite waste disposal and houses with subsurface basements. The stones limit landscaping. Control of erosion and sedimentation are needed in areas disturbed for construction.

This soil is in capability subclass VIs and woodland group 2o.

WgD—Wellsboro very stony silt loam, 8 to 25 percent slopes. This sloping and moderately steep, moderately well drained and somewhat poorly drained soil in on convex mountaintops and plateaus and on mountainsides and hillsides. The areas are elongated to rounded and range from 5 to 50 acres.

Typically, the surface layer is dark brown channery silt loam about 8 inches thick. The subsoil extends to a depth of 52 inches. The upper 6 inches of the subsoil is reddish brown channery silt loam; the next 6 inches is reddish brown, mottled channery silt loam; and the lower 32 inches is a fragipan of mottled; dark reddish brown channery loam. The substratum is mottled, dark reddish brown channery loam to a depth of 60 inches.

Included with this soil in mapping are small areas of Oquaga, Mardin, and Morris soils and a few areas of soils that have more than 15 percent stones on the surface. South of Lopez is a considerable acreage of soils that are similar to Wellsboro soils but that have a light gray to white channery sandy loam surface layer about 6 inches thick. Inclusions make up as much as 25 percent of the mapped acreage.

This Wellsboro soil has slow permeability. The available water capacity is moderate. Surface runoff is rapid. Stones and boulders cover 3 to 15 percent of the surface. In unlimed areas this soil is very strongly acid to medium acid throughout. A seasonal high water table is at a depth of 12 to 36 inches during wet periods. Rooting depth is restricted by the seasonal high water table and the fragipan.

Most areas of this soil are used for woodland. A few areas are used for pasture. The rest are being developed for urban uses.

No areas of this soil are cultivated. The soil is too stony for cultivated crops and pasture, and removing the stones and trees is not feasible.

Productivity of trees is high. Slope moderately limits use of equipment. Use of equipment may also be temporarily limited during wet periods by the seasonal high water table, and machine planting is limited by the stones.

Most nonfarm uses are limited by the slow permeability, seasonal high water table, large stones on the surface, and moderately steep slope. Slope, permeability, and the water table seriously limit use for onsite waste disposal and houses with subsurface basements. Slope and the stones limit landscaping. Control of erosion and sedimentation are needed in areas disturbed for construction.

This soil is in capability subclass VIs and woodland group 2r.

WmB—Wyoming gravelly sandy loam, 3 to 8 percent slopes. This gently sloping, somewhat excessively drained soil is on stream terraces and the top of terraces on valley sides. The areas are rounded to narrow and range from 5 to 20 acres.

Typically, the surface layer is very dark grayish brown gravelly sandy loam 2 inches thick. The subsurface layer extends to a depth of 9 inches and is dark brown gravelly sandy loam. The subsoil extends to a depth of 26 inches and is brown gravelly sandy loam and dark brown very gravelly coarse sandy loam. The substratum is dark brown gravelly and very gravelly sand to a depth of 60 inches.

Included with this soil in mapping are small areas of Alton, Chenango, and Braceville soils. Inclusions make up as much as 15 percent of the mapped acreage.

This Wyoming soil has rapid permeability and very low to low available water capacity. Surface runoff is slow. The surface layer is 15 to 50 percent coarse fragments. In unlimed areas this soil is medium acid to very strongly acid throughout.

Many areas of this soil are used for cultivated crops, and many are used for pasture. A few areas are used for woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is moderate. Cover crops, crop rotation, and use of crop residue and manure control erosion, increase water holding capacity, and help maintain organic matter content and good tilth. Yields may decrease during dry years because of very low to low available water capacity. The gravelly surface interferes with seeding and mechanical harvesting of some crops.

The chief management needs for pasture are proper stocking rates to maintain adapted plant species, pasture rotation, and periodic applications of nutrients.

Productivity of trees is moderate. The very low to low available water capacity causes severe seedling mortality. Machine planting is practical.

Some nonfarm uses are limited by the rapid permeability and large content of coarse fragments. If this soil is used for waste disposal, ground water can be contaminated by seepage through the rapidly permeable subsoil and substratum. Deep excavations are unstable because of the

large content of coarse fragments. Lawns may need additions of topsoil because of the content of coarse fragments. Many areas are a fair to good source of gravel and sand.

This soil is in capability subclass IIIs and woodland group 4f.

WmC—Wyoming gravelly sandy loam, 8 to 15 percent slopes. This sloping, somewhat excessively drained soil is on stream terraces, kames, and dissected tops of terraces on valley sides. These areas are rounded to narrow and range from 5 to 40 acres.

Typically, the surface layer is very dark grayish brown gravelly sandy loam 2 inches thick. The subsurface layer extends to a depth of 9 inches and is dark brown gravelly sandy loam. The subsoil extends to a depth of 26 inches and is brown gravelly sandy loam and dark brown very gravelly coarse sandy loam. The substratum is dark brown gravelly and very gravelly sand to a depth of 60 inches.

Included with this soil in mapping are small areas of Alton, Chenango, and Braceville soils. Inclusions make up as much as 10 percent of the mapped acreage.

This Wyoming soil has rapid permeability and very low to low available water capacity. Surface runoff is medium. The surface layer is 15 to 50 percent coarse fragments. In unlimed areas this soil is medium acid to very strongly acid throughout.

Most areas of this soil are used for pasture. Many areas are used for cultivated crops, and a few areas are used for woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is severe. Cover crops, crop rotation, and use of crop residue and manure control erosion, increase available water capacity, and help maintain organic matter content and good tilth. Yields may decrease during dry years because of very low to low available water capacity. The gravelly surface interferes with seeding and mechanical harvesting of some crops.

The chief management needs for pasture are proper stocking rates to maintain adapted plant species, pasture rotation, and periodic applications of nutrients.

Productivity of trees is moderate. The very low to low available water capacity causes severe seedling mortality. Machine planting is practical.

Some nonfarm uses are limited by the rapid permeability and large content of coarse fragments. If this soil is used for onsite waste disposal, ground water can be contaminated by seepage through the rapidly permeable subsoil and substratum. Deep excavations are unstable because of the large content of coarse fragments. Lawns may need additions of topsoil because of the content of coarse fragments. Control of erosion and sedimentation are needed in areas disturbed for construction. Many areas are a fair to good source of gravel and sand.

This soil is in capability subclass IVs and woodland group 4f.

WmD—Wyoming gravelly sandy loam, 15 to 25 percent slopes. This moderately steep, somewhat excessively drained soil is on kames, eskers, and terraces on valley sides. These areas are elongated to narrow and range from 5 to 50 acres.

Typically, the surface layer is very dark grayish brown gravelly sandy loam 2 inches thick. The subsurface layer extends to a depth of 9 inches and is dark brown gravelly sandy loam. The subsoil extends to a depth of 26 inches and is brown gravelly sandy loam and dark brown very gravelly coarse sandy loam. The substratum is dark brown gravelly and very gravelly sand to a depth of 60 inches.

Included with this soil in mapping are small areas of Chenango and Alton soils. Inclusions make up as much as 10 percent of the mapped acreage.

This Wyoming soil has rapid permeability and very low to low available water capacity. Surface runoff is very rapid. The surface layer is 15 to 50 percent coarse fragments. In unlimed areas this soil is medium acid to very strongly acid throughout.

Many areas of this soil are used for pasture or for woodland. Many areas formerly pastured or cultivated are now idle and are reverting to woodland. A few areas are used for cultivated crops or hay. The rest are being developed for urban uses or are idle and provide wildlife habitat.

If this soil is cultivated, the erosion hazard is very severe. In some areas stripcropping, crop rotation, minimum tillage, and diversions reduce runoff and control erosion. Where slope exceeds 20 percent, use of machinery may be hazardous. Coarse fragments may interfere with seeding, applying nutrients, and harvesting.

The chief management needs for pasture are proper stocking rates to maintain adapted plant species, pasture rotation, and periodic applications of nutrients.

Productivity of trees is moderate. The very low and low available water capacity causes severe seedling mortality. Slope moderately limits use of equipment.

Most nonfarm uses are limited by the moderately steep slope, large content of coarse fragments, and rapid permeability. Ground water can be contaminated by seepage through the rapidly permeable subsoil and substratum. Deep excavations are unstable because of the large content of coarse fragments. Slope seriously limits use for onsite waste disposal and houses. Lawns may need additions of topsoil because of the content of coarse fragments. Control of erosion and sedimentation are needed in areas disturbed for construction. Many areas are a fair to good source of gravel and sand.

This soil is in capability subclass IVe and woodland group 4f.

WmF—Wyoming gravelly sandy loam, 25 to 45 percent slopes. This steep and very steep, somewhat excessively drained soil is on the sides of eskers and on terraces on valley sides. The areas are long and narrow and range from 5 to 50 acres.

Typically, the surface layer is very dark grayish brown gravelly sandy loam 2 inches thick. The subsurface layer extends to a depth of 9 inches and is dark brown gravelly sandy loam. The subsoil extends to a depth of 26 inches and is brown gravelly sandy loam and dark brown very gravelly coarse sandy loam. The substratum is dark brown gravelly and very gravelly sand to a depth of 60 inches.

Included with this soil in mapping are small areas of Chenango and Alton soils and a few areas of Wyoming soils that have a very gravelly sandy loam surface layer. Inclusions make up as much as 15 percent of the mapped acreage.

This Wyoming soil has rapid permeability and very low to low available water capacity. Surface runoff is rapid. The surface layer is 15 to 50 percent coarse fragments. In unlimed areas this soil is medium acid to very strongly acid throughout.

Most areas of this soil are used for woodland. A few areas are used for pasture. Many areas formerly pastured or cultivated are now idle and are reverting to woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

This soil is too steep for cultivated crops or pasture. The hazard of erosion is very severe if the soil is cultivated.

Productivity of trees is moderate. The very low and low available water capacity causes severe seedling mortality. Slope causes severe equipment limitations and moderate erosion hazard. Machine planting is limited by the slope.

Most nonfarm uses are limited by steep and very steep slope and rapid permeability. Slope seriously limits use for onsite waste disposal, houses with basements, and landscaping. Ground water can be contaminated by seepage through the rapidly permeable subsoil and substratum. Deep excavations are unstable because of the large content of coarse fragments. Control of erosion and sedimentation is needed in areas disturbed for construction.

This soil is in capability subclass VIIe and woodland group 4f.

WoC—Wyoming very stony sandy loam, 3 to 15 percent slopes. This gently sloping and sloping, somewhat excessively drained soil is on stream terraces where high gradient tributaries enter major streams after flowing through very stony upland areas. Most areas are in Sullivan County. The areas are shaped like a fan or triangle and range from 20 to 100 acres.

Typically, the surface layer is very dark grayish brown gravelly sandy loam 2 inches thick. The subsurface layer extends to a depth of 9 inches and is dark brown gravelly sandy loam. The subsoil extends to a depth of 26 inches and is brown gravelly sandy loam. The substratum is dark brown gravelly and very gravelly sand to a depth of 60 inches.

Included with this soil in mapping are small areas of nonstony Wyoming soils, Udifluvents, and very stony wetter soils. Inclusions make up as much as 20 percent of the unit.

This Wyoming soil has rapid permeability and very low to low available water capacity. Surface runoff is slow to medium. Stones cover 3 to 15 percent of the surface. In unlimed areas this soil is medium acid to very strongly acid throughout.

Most areas of this soil are used for woodland. The rest are being developed for urban uses or are idle and provide wildlife habitat.

No areas of this soil are cultivated or used for pasture. This soil is too stony for cultivated crops and pasture, and removing the stones and trees is not feasible.

Productivity of trees is moderate. The very low and low available water capacity causes severe seedling mortality. Machine planting is limited by the stones.

Some nonfarm uses are limited by the rapid permeability, large content of coarse fragments, and large stones on the surface. The stones limit landscaping. If this soil is used for onsite waste disposal, ground water can be contaminated by seepage through the rapidly permeable subsoil and substratum. Deep excavations are unstable because of the large content of coarse fragments. Lawns need additions of topsoil because of the content of coarse fragments. Control of erosion and sedimentation is needed in areas disturbed for construction. Some areas are a fair source of gravel and sand.

This soil is in capability subclass VIs and woodland group 4f.

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

crops and pasture

John C. Spitzer, conservation agronomist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Agriculture is a major land use in Bradford and Sullivan Counties. In the two counties in 1975, 288,600 acres was used for crops and pasture, including 96,680 acres of permanent pasture. In 1977, there were 45,200 acres of corn for grain and silage, 10,690 acres of small grain, and 106,000 acres of alfalfa and other hay; the rest was used for other crops, pasture, conservation use only, or idle cropland.

Many of the soils in Bradford and Sullivan Counties are too stony for crops. However, the soils with few or no surface stones have good potential for crops. About 27,229 acres of potentially good cropland is currently being used for woodland, and about 12,643 acres is used for pasture and hay or is temporarily idle. In addition to the production potential in this land, food production could be increased considerably by using the latest crop production technology. This soil survey can facilitate the application of such technology.

Soil erosion is the major management problem on most of the cropland and pasture in Bradford and Sullivan Counties. Loss of topsoil to erosion causes reduced production. This is especially true on soils that are moderately deep to bedrock, that have a fragipan, or that have low or very low available water capacity. Wellsboro, Mardin, and Volusia soils have a fragipan. Oquaga and Lordstown soils are moderately deep to bedrock. Wyoming soils are deep but have low or very low available water capacity.

In many sloping fields of channery soils, preparing a good seedbed and tilling are difficult because much of the original surface layer has been eroded away, leaving many coarse fragments on the surface. Such areas are common on Lordstown channery silt loam and Oquaga channery silt loam.

Soil erosion also results in deposition of sediment in streams and reservoirs, pollution of streams, and reduced water quality for all uses.

Unadilla, Wellsboro, and Mardin soils are among the most productive soils in the area, but they are highly susceptible to erosion. On these and other soils, good

conservation practices are needed to reduce the hazard of erosion and to increase production.

Good conservation and erosion control practices provide protective cover, reduce runoff and sedimentation, and increase infiltration. A cropping system that maintains a plant cover keeps erosion losses to a minimum. On pasture, the legume and grass forage crops help reduce erosion on sloping land and also provide nutrients and improve tilth.

Diversions and terraces reduce the length of slope and therefore reduce erosion. Diversions and terraces are most practical on deep, well drained to somewhat poorly drained soils that have moderate but uniform slopes. Volusia and Mardin soils are generally suitable for diversions. Some other soils are less suitable because of steep or irregular slopes, excessive wetness, or bedrock at a depth of less than 40 inches.

Contour farming and stripcropping are common erosion control practices in the survey area. They are best adapted to soils with smooth, uniform slopes, including most areas of the sloping Mardin, Morris, and Wellsboro soils. However, some areas of these soils have irregular slopes that make contour tillage or terracing impractical. On these soils, cropping systems that provide substantial plant cover are needed to control erosion.

Additional soil protection is provided by minimum tillage. Minimizing tillage, growing cover crops, and leaving crop residue on the surface increase infiltration and reduce the erosion hazard. These practices can be adapted to most soils in the survey area. No-tillage for corn is effective in reducing erosion on sloping land and can be adapted to most soils in the area except the poorly drained and very poorly drained soils.

Soil drainage is a major management problem on many of the soils in Bradford and Sullivan Counties. Some soils are so wet that crop production is not practical or economically feasible without artificial drainage. Examples are the poorly drained and very poorly drained Chippewa and Holly soils, which cover approximately 38,140 acres of the survey area.

In somewhat poorly drained soils, wetness damages crops in most years unless artificial drainage is applied. In this category are Morris and Volusia soils. These soils cover about 365,400 acres.

Drainageways and swales may include small, wet areas. These areas are generally inclusions in areas of moderately well drained Mardin soils and moderately well drained and somewhat poorly drained Wellsboro soils. Artificial drainage could improve the management and productivity of most of these areas.

The design of drainage systems varies with the kind of soil. A combination of surface drainage and subsurface drainage is usually needed for poorly drained soils that are intensively cropped. Drains have to be more closely spaced in soils with slow permeability than in more permeable soils. Finding adequate outlets for drainage systems is often difficult, as in Holly and Chippewa soils.

Fertility is naturally low in many soils in the survey area. Many soils on uplands are strongly acid. They require applications of ground limestone to supply calcium and to raise the pH sufficiently for good growth of alfalfa and other crops. Levels of available phosphorus and magnesium are naturally low in most soils. The addition of soil amendments should be based on soil tests, needs of the crop, and expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime to apply.

Soil tilth is an important factor in seed germination and infiltration of water. Soils with good tilth are granular and porous. Pope and Linden soils, for example, have good tilth.

Many soils used for crop production in the survey area have relatively little organic matter in the surface layer. The structure of such soils is generally weak, and intensive rainfall usually causes formation of a surface crust that is hard and nearly impervious to water when the soil is dry. This crust usually reduces infiltration and increases runoff. Regular additions of crop residue, manure, and other organic material improve soil structure and reduce crust formation.

If soils that have a silt loam surface layer low in organic matter are plowed in fall, a crust commonly forms during winter and spring. Many soils are nearly as dense and hard at planting time after fall plowing as they were before they were plowed. In addition, sloping soils are subject to accelerated erosion if they are plowed in fall.

Corn is the major row crop grown in the survey area. Oats is the common close-growing grain crop.

Special commercial crops produced in the survey area are maple syrup, apples, potatoes, and nursery plants. Soils that are deep and well drained and that warm up early in spring are most suitable for special crops. Good air drainage is needed to reduce frost damage to apples. Latest information and suggestions for growing special crops can be obtained from the Cooperative Extension Service and the Soil Conservation Service.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting

and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds; plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Detailed soil map units."

woodland management and productivity

Paxton G. Wolfe, woodland conservationist, Soil Conservation Service, assisted in preparing this section.

Bradford and Sullivan Counties have approximately 636,300 acres of woodland (Bradford County 382,100 acres, Sullivan County 254,200 acres) (*9*). This is 61 percent of the area of the two counties (52 percent of Bradford County, 83 percent of Sullivan County). Farmers and other private concerns own 66 percent of the woodland in the counties, the forest industry owns 12 percent, and 22 percent is public owned. (The woodland in Bradford County is 83 percent private, 5 percent industry, and 12 percent public owned; that in Sullivan County is 41 percent private, 23 percent industry, and 36 percent public owned.) Less than 0.5 percent of the woodland in the survey area is classified as noncommercial. The woodland consists of stands of second- and third-growth trees.

The principal forest types (*6*) that presently make up the commercial woodland in the survey area and the extent of each are as follows:

Maple-beech-birch forest type makes up 68 percent of the woodland in the two counties (54 percent in Bradford County, 90 percent in Sullivan County). Sugar maple, beech, and yellow birch are the main species in this forest type. Associated species include basswood, red maple, hemlock, red oak,

white ash, white pine, black birch, black cherry, yellow-poplar, and cucumbertree.

Oak-hickory forest type makes up 10 percent of the woodland in the counties (17 percent in Bradford County, 1 percent in Sullivan County). This forest type consists mainly of red, chestnut, and white oak and hickories. The principal associated species are white ash, sugar and red maple, beech, and occasionally a few yellow-poplar, black cherry, and black oak.

Elm-ash-red maple forest type makes up 3 percent of the woodland in the survey area (Bradford County only, 5 percent). This forest type is mainly ash, American elm, and red maple. Associated species include slippery elm, yellow birch, sycamore, and hemlock.

Aspen-birch forest type makes up 5 percent of the woodland (8 percent in Bradford County, minimal area in Sullivan County). Quaking aspen, bigtooth aspen, and gray birch are the main species. Principal associated species are pin cherry, sugar and red maple, yellow birch, white pine, and ash.

White pine forest type makes up 14 percent of the woodland in the counties (16 percent in Bradford County, 9 percent in Sullivan County). White pine is pure or predominant. Principal associated species are Virginia pine, red pine, pitch pine, ash, sugar and red maple, hemlock, red and white oak, quaking and bigtooth aspen, and paper, yellow, and black birch.

Productivity is very high, high, or moderately high on 83 percent of the woodland in the two counties. Productivity is moderate on 4 percent of the woodland and poor on 13 percent.

Sawtimber makes up approximately 44 percent of the acreage of commercial woodland in the two counties, poletimber makes up 34 percent, and 22 percent is classified as other stands. (The commercial woodland in Bradford County is 29 percent sawtimber, 41 percent poletimber, and 30 percent other; that in Sullivan County is 66 percent sawtimber, 25 percent poletimber, and 9 percent other.)

More intensive woodland management will encourage the growth of selected crop trees for sawtimber on soils that have very high, high, and moderately high potential productivity. Soil having low potential productivity generally will not economically justify a high level of management to increase yields of wood crops.

Soils having moderate potential productivity are the most difficult to appraise for management of wood crops. A thorough inventory of the growing stock on the site and its quality is needed. The market potential of the species and the productivity of associated soils also partly determine the level of woodland management that is economically feasible.

Bradford and Sullivan Counties have ideal climate for maple syrup production. Sugar bushes can be established on the deep, well drained and moderate well drained soils where poletimber-size sugar maples are the main species. The two counties also have potential for good Christmas tree production.

The woodland in Bradford and Sullivan Counties is valuable for watershed protection, recreation, wildlife habitat, and enjoyment as well as being a source of income. The better sites should be quite productive if properly managed for wood crops and if protected from fire, disease, insects, and livestock.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *d*, restricted root depth; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, d, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots

and the ability of the soil to hold trees firmly. A rating of *slight* indicates that a few trees may be blown down by normal winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in 50 years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor for wood crop production. These are the species that have the best growth rate, quality, value, and marketability. Other species that commonly grow in the area are also listed regardless of value or potential.

Trees to plant are those that are suited to the soils and to commercial wood production.

recreation

Willard Persun, waterways patrolman, Pennsylvania Fish Commission; Chester Harris and George Sprankle, land managers, Pennsylvania Game Commission; and Nicholas Lylo and Max Coy, district foresters, Pennsylvania Bureau of Forestry, assisted in preparing this section.

Recreation is important in Bradford and Sullivan Counties. Activities such as hunting, fishing, hiking, swimming, and snowmobiling are major attractions for residents and nonresidents. The two counties are part of the Endless Mountains region of north-central Pennsylvania. Many people visit these counties every year and are an important source of income.

Among the major attractions are wooded and open areas suitable for vacation homesites, lakes and streams for boating and fishing, and large areas of State game and forest lands. Loyalsock Hiking Trail, Eagle's Mere Toboggan Slide, Forksville Bowman's Festival, and the camping facilities at World's End State Park are a few of the attractions which bring recreationists to Sullivan County. Mount Pisgah State Park, four county parks, and the French Asylum Museum likewise attract many to Bradford County.

Eleven State game lands and the Wyoming and Robwood Mountain State Forests comprise 144,000 acres in the two counties. Streams such as Schrader Creek in Bradford County and Loyalsock Creek in Sullivan County provide more than 160 miles of stocked streams for trout fishing. Warm-water lakes and ponds offer 15,000 acres of good fishing for bass, bullhead, and perch. The Susquehanna River offers 46 miles of fishing for muskellunge, walleye, and pickerel.

Most soils in these counties have potential for some type of recreational development. The deep, well drained soils with few or no surface stones, such as Alton, Linden, and Unadilla soils, have the best potential for most recreational uses. In many areas, the ground is very stony or extremely stony. The stones seriously limit the more intensive recreational uses such as ball fields and golf courses. These soils have potential for hiking trails, hunting, and other types of recreation that require only slight alteration of the land. Poorly drained and very poorly drained soils, such as Chippewa and Holly soils, have the least potential for most recreational uses.

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

Clayton L. Heiney, wildlife biologist, Soil Conservation Service, assisted in preparing this section.

The occurrence and abundance of wildlife in Bradford and Sullivan Counties are related to kinds of soils. The distribution of vegetation depends on the pattern, or combinations, of soils. An area supports the wildlife whose habitat requirements (food and cover) are met by the vegetation there. If the conditions in the area are altered by drainage or by other practices used in managing farms or woodland, the kinds and patterns of vegetation change. If the vegetation changes, the kinds and numbers of wildlife change.

The principal game species in these counties are white-tailed deer, black bear, snowshoe hare, gray squirrel, cottontail rabbit, ruffed grouse, turkey, and waterfowl. Important furbearers are beaver, muskrat, mink, and red fox. There is also a large variety of nongame wildlife, including songbirds, reptiles, amphibians, and small mammals. Both game and nongame animals are important in maintaining the diversity and stability of ecosystems in the area.

White-tailed deer and turkey are considered forest species, but they prefer a combination of brush or young trees, fewer mature trees, and small open areas. Deer are found throughout the two counties.

Gray squirrels, cottontail rabbits, and ruffed grouse are also found throughout the counties. Ruffed grouse prefer young, brushy stands of trees and open areas much like the habitat of white-tailed deer. Squirrels are especially common in areas of mature, nut-producing trees. Cottontail rabbits are found mostly in farmed areas. Abandoned farms growing up in brush usually contain large populations of cottontails. Red fox are also common in such areas because of the large populations of mice and rabbits.

Black bear prefer forests that have mixed stands of conifers and hardwoods of various ages and ample water in streams, ponds, and lakes. Black bear are found in Sullivan County and the southwestern part of Bradford County. This area consists mainly of upland forests and swamps.

Northeastern Pennsylvania, including the mountainous parts of Bradford and Sullivan Counties, has the State's largest populations of snowshoe hare. Snowshoe hare are found in cool, shrubby bogs or swamps that are thickly overgrown with spruce, hemlock, alder, or hardhack.

Muskrat, mink, and beaver are found along rivers, lakes, and ponds. Muskrat are found throughout the county, whereas mink and beaver are usually found only in the more remote areas.

Waterfowl are abundant. The most common species (mallard, Canada goose, wood duck, and black duck) frequent the Susquehanna River, its tributaries, and the numerous ponds, lakes, and beaver dams of the area.

The distribution and abundance of the wildlife species in Bradford and Sullivan Counties has been greatly affected by changes in land use, especially the increase in rural homesites. The distribution of species such as black bear and turkey is affected more by man's activities and development than by soil type or vegetation.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or

maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, shore birds, muskrat, mink, and beaver.

engineering

John J. Mank, assistant state conservation engineer, Soil Conservation Service, helped prepare this section.

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 11 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or

maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of

sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

physical and chemical properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 15, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or

very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*10*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 17, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Fluvaquents (*Fluv*, meaning water deposited plus *aquent*, the suborder of the Entisols that have an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Fluvaquents.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, nonacid, mesic Typic Fluvaquents.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*8*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*10*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Alton series

Soils of the Alton series are loamy-skeletal, mixed, mesic Dystric Eutrochrepts. They are deep, well drained and somewhat excessively drained soils that formed in glacial outwash derived from sandstone, siltstone, and limestone. Alton soils are on stream terraces adjacent to major streams. Slope ranges from 0 to 8 percent.

Alton soils are on stream terraces with well drained and somewhat excessively drained Chenango soils, well drained Unadilla soils, somewhat poorly drained and moderately well drained Braceville soils, and somewhat poorly drained and poorly drained Rexford soils. Alton

soils contain more sand in the particle-size control section than Chenango and Unadilla soils.

Typical pedon of Alton gravelly sandy loam, 0 to 8 percent slopes, in a crop field in Bradford County, Asylum Township, in Macedonia; 2.2 miles south of Wysox bridge on Pa. Hwy. 187, 100 feet east of telephone pole number 6A412 and 25 feet south of field road:

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) gravelly sandy loam; weak and moderate medium granular structure; very friable, slightly sticky and nonplastic; 25 percent coarse fragments; slightly acid; abrupt smooth boundary.

B21—8 to 14 inches; yellowish brown (10YR 5/4) gravelly sandy loam; weak fine subangular blocky structure; very friable, slightly sticky and slightly plastic; 25 percent coarse fragments; slightly acid; clear wavy boundary.

B22—14 to 18 inches; yellowish brown (10YR 5/4) gravelly sandy loam; weak medium subangular blocky structure; very friable, slightly sticky and slightly plastic; 30 percent coarse fragments; slightly acid; gradual wavy boundary.

B3—18 to 36 inches; brown (10YR 5/3) gravelly sandy loam; weak medium subangular blocky structure; very friable, nonsticky and nonplastic; few thin dark yellowish brown (10YR 4/4) clay patches on coarse fragments; 45 percent coarse fragments; neutral; gradual wavy boundary.

C—36 to 60 inches; brown (10YR 5/3) and dark yellowish brown (10YR 4/4) very gravelly loamy sand; massive; loose, slightly sticky and nonplastic; many thin dark yellowish brown (10YR 4/4) clay patches on coarse fragments; 60 percent coarse fragments; neutral.

The solum is 30 to 60 inches thick. Depth to bedrock is 8 feet or more. Coarse fragments make up 20 to 50 percent of the A horizon and the upper part of the B horizon and 40 to 60 percent of the lower part of the B horizon and the C horizon. Content of coarse fragments averages more than 35 percent in the particle-size control section. The fine-earth fraction of the control section is 50 to 70 percent fine to coarse sand. In unlimed areas reaction is strongly acid to neutral above a depth of 30 inches and medium acid to mildly alkaline below. Carbonates occur between depths of 40 and 80 inches.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3.

The B horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 3 or 4. Fine earth texture is loam and sandy loam above a depth of 20 inches and sandy loam and loamy sand below.

The C horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma or 2 to 4. Fine earth texture is loamy sand and sand.

Aquepts

Aquepts are deep, somewhat poorly drained to very poorly drained soils that formed in alluvium and glacial till derived from sandstone and siltstone. The soils are in depressional areas and concave areas on mountaintops and plateaus. Slope ranges from 0 to 8 percent.

Aquepts are on glaciated uplands with very poorly drained and poorly drained Norwich soils, very poorly drained Medisaprists, and somewhat poorly drained Morris soils. Aquepts contain more boulders, stones, and coarse fragments than those soils. Aquepts have a water table above a depth of 18 inches most of the time. Because of the variability of Aquepts, a typical pedon is not given.

The solum is 18 to 36 inches thick. Stones and boulders 1 to 5 feet in diameter cover 50 to 100 percent of the surface and make up 50 to 75 percent of the volume to a depth of 60 inches or more. There are fewer large rock fragments and more smaller rock fragments in the B and C horizons than in the A horizon.

The A horizon ranges from 5 to 20 inches in thickness. Space between the rock fragments is occupied by leaf litter, roots, decaying organic matter, air, water, and as much as 25 percent soil material. The A1 horizon has hue of 2.5Y to 7.5YR, value of 2 to 4, and chroma of 1 or 2. Fine earth texture of the A1 horizon is loam, silt loam, or light silty clay loam. The A2 horizon has hue of 5Y to 7.5YR, value of 3 to 6, and chroma of 0 to 2. Some pedons have mottles of higher chroma. Fine earth texture of the A2 horizon is sandy loam, loam, silt loam, or light silty clay loam. The fine earth fraction is generally less than 25 percent of the volume and is between closely spaced rock fragments and on the surface of the rock fragments.

The B horizon ranges from 12 to 24 inches in thickness. It has hue of 5Y to 7.5YR, value of 3 to 6, and chroma of 1 to 3. Some pedons have mottles of higher chroma. Consistence is firm and brittle in some pedons and friable in others.

The C horizon has hue of 5Y to 7.5YR, value of 3 to 6, and chroma of 1 to 4. Fine earth texture is loamy sand, sandy loam, or loam to a depth of 60 inches or more.

Arnot series

Soils of the Arnot series are loamy-skeletal, mixed, mesic Lithic Dystrochrepts. They are shallow, somewhat excessively drained to moderately well drained soils that formed in glacial till derived from sandstone and siltstone. Arnot soils are on ridges, upper convex hillsides, knolls, and tops and sides of mountains. Slope ranges from 3 to 25 percent.

Arnot soils are on glaciated uplands with moderately deep, well drained and somewhat excessively drained Oquaga soils; moderately deep, well drained Lordstown soils; deep, moderately well drained and somewhat poorly drained Wellsboro soils; and deep, somewhat poorly drained Morris soils.

Typical pedon of Arnot very channery loam in an area of Arnot-Rock outcrop complex, 3 to 25 percent slopes, in woodland in Bradford County, Monroe Township; 1.6 miles south of Powell on Route 08007 to Kellogg Fire Tower Road, 0.4 miles northwest of fire tower, 135 feet west of road and 60 feet south of rock ledge.

O1—2 inches to 1 inch; oak, huckleberry, and grass litter.
O2—1 inch to 0; black (10YR 2/1) decomposed leaf litter; very strongly acid; abrupt smooth boundary.
A1—0 to 2 inches; brown (7.5YR 4/2) very channery loam; weak very fine granular structure; very friable, nonsticky and nonplastic; 60 percent coarse fragments; very strongly acid; abrupt wavy boundary.
B21—2 to 6 inches; strong brown (7.5YR 5/6) very channery loam; weak fine subangular blocky structure; friable, nonsticky and nonplastic; 60 percent coarse fragments; very strongly acid; clear wavy boundary.
B22—6 to 11 inches; brown (7.5YR 5/4) very channery silt loam; weak medium subangular blocky structure; friable, nonsticky and slightly plastic; 50 percent coarse fragments; very strongly acid; clear wavy boundary.
B23—11 to 15 inches; brown (7.5YR 5/4) channery loam; weak fine and medium subangular blocky structure; friable, nonsticky and slightly plastic; 45 percent coarse fragments; very strongly acid; abrupt smooth boundary.
R—15 inches; light gray (5YR 7/1) medium-grained massive sandstone.

The solum thickness and depth to bedrock are 10 to 20 inches. Coarse fragments make up 50 to 70 percent of the A horizon and 35 to 70 percent of the B horizon. They make up more than 35 percent of the particle-size control section. In unlimed areas reaction is extremely acid to medium acid throughout.

The Ap and A1 horizons have hue of 10YR to 5YR, value of 2 to 4, and chroma of 2 or 3.

The B horizon has hue of 10YR to 5YR, value of 4 to 6, and chroma of 3 to 6. Fine earth texture is silt loam and loam.

The C horizon, where present, consists of rock fragments with loam or silt loam coatings. Coatings have hue of 10YR to 5YR, value of 3 to 5, and chroma of 3 to 6.

Few or common mottles with chroma of 3 to 6 are present in the lower part of some pedons.

Braceville series

Soils of the Braceville series are coarse-loamy, mixed, mesic Typic Fragiochrepts. They are deep, somewhat poorly drained and moderately well drained soils that formed in glacial outwash derived from sandstone and siltstone. Braceville soils are on stream terraces and terraces on valley sides. These terraces are along major and secondary streams. Slope ranges from 0 to 8 percent.

Braceville soils are on terraces with somewhat excessively drained Wyoming soils, well drained and somewhat excessively drained Alton and Chenango soils, and somewhat poorly drained and poorly drained Rexford soils.

Typical pedon of Braceville silt loam, 0 to 8 percent slopes, in a crop field in Bradford County, Columbia Township, east of Sylvania; along Route 08045, 0.75 mile from U.S. 6, 235 yards south-southeast of barn:

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam; moderate fine and medium granular structure; friable, slightly sticky and slightly plastic; 5 percent coarse fragments; medium acid; abrupt smooth boundary.
B21—8 to 13 inches; yellowish brown (10YR 5/4) silt loam; moderate fine subangular blocky structure; friable, slightly sticky and plastic; 5 percent coarse fragments; strongly acid; clear wavy boundary.
B22—13 to 18 inches; brown (10YR 5/3) loam; moderate medium subangular blocky structure; friable, slightly sticky and plastic; 5 percent coarse fragments; strongly acid; clear wavy boundary.
B23—18 to 22 inches; brown (10YR 5/3) loam; common fine faint grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; friable to firm, slightly sticky and plastic; 10 percent coarse fragments; strongly acid; clear irregular boundary.
Bx—22 to 37 inches; gravelly loam; brown (7.5YR 4/4) prism interiors, yellowish brown (10YR 5/8) prism edges separated by light brownish gray (2.5Y 6/2) and light gray (2.5Y 7/2) wedges; many medium distinct and prominent reddish brown (5YR 4/4), dark reddish brown (5YR 3/3), and light gray (2.5Y 7/2) mottles; strong very coarse prismatic structure; firm and very firm, brittle, slightly sticky and slightly plastic; 25 percent coarse fragments; strongly acid; clear smooth boundary.
C—37 to 42 inches; gray (5Y 6/1) very fine sandy loam; many medium prominent reddish brown (5YR 4/3) and strong brown (7.5YR 5/6) mottles; weak fine and medium platy structure; firm, slightly sticky and slightly plastic; common white (5Y 8/1) stratified sand lenses; 10 percent coarse fragments; medium acid; clear wavy boundary.
IIC—42 to 60 inches; reddish brown (5YR 4/3) gravelly sandy loam; common medium prominent light gray (2.5Y 7/2) mottles; single grain; very friable, nonsticky and nonplastic; 30 percent coarse fragments; medium acid.

The solum is 34 to 55 inches thick. Depth to the fragipan ranges from 15 to 30 inches. Depth to bedrock is 8 feet or more. Coarse fragments make up 0 to 10

percent of the A horizon, 0 to 25 percent of the B2 horizon, 20 to 50 percent of the Bx horizon, and 10 to 70 percent of the C horizon. In unlimed areas reaction is very strongly acid to medium acid above the Bx horizon and strongly acid to slightly acid in the Bx and C horizons.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 to 4.

The B2 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. Mottles are between depths of 12 and 30 inches. Fine earth texture is silt loam to sandy loam.

The Bx horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 3 to 6 and has mottles with chroma of 1 to 6. Fine earth texture is silt loam to sandy loam.

The C horizon has hue of 5YR to 5Y, value of 4 to 7, and chroma of 1 to 8. Fine earth texture is sandy loam to sand.

Canadice series

Soils of the Canadice series are fine, illitic, mesic Typic Ochraqualfs. They are deep, poorly drained soils that formed in moderately calcareous sediment deposited in glacial ponds and lakes. Canadice soils are on lake plains, in ponded areas along stream valleys, and in upland depressions near the heads of drainageways. Slope ranges from 0 to 3 percent.

Canadice soils are on lake plains with somewhat poorly drained and poorly drained Rexford soils; in ponded areas along stream valleys with very poorly drained and poorly drained Holly soils and very poorly drained Medisaprists; and in upland depressions with poorly drained and very poorly drained Chippewa soils. Canadice soils contain more clay in the particle-size control section than Rexford, Holly, and Chippewa soils and Medisaprists.

Typical pedon of Canadice silty clay loam, 0 to 3 percent slopes, in a crop field in Bradford County, Columbia Township; 3.2 miles north of Columbia Crossroads on Pa. Hwy. 14, 250 feet east of Pa. Hwy. 14 and 900 feet south of farm house:

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam; strong coarse and very coarse granular structure; friable, sticky and very plastic; slightly acid; abrupt smooth boundary.

B21g—9 to 18 inches; gray (10YR 5/1) silty clay loam; many medium distinct and prominent reddish brown (5YR 4/4), brown (7.5YR 4/4), and olive (5Y 5/6) mottles; moderate medium prismatic structure parting to weak medium angular blocky; firm, sticky and very plastic; medium acid; gradual wavy boundary.

B22tg—18 to 31 inches; silty clay; grayish brown (2.5Y 5/2) prism interiors, gray (N 5/) prism faces; many medium distinct gray (N 5/) and strong brown (7.5YR 5/6) mottles; strong medium prismatic structure; firm, sticky and very plastic; dark gray (N 4/) to gray (N 6/) moderately thick clay films on ped faces; neutral; clear smooth boundary.

B23tg—31 to 45 inches; silty clay; olive gray (5Y 5/2) prism interiors, gray (N 6/) prism faces; many medium prominent gray (N 6/) and yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure; firm, sticky and very plastic; gray (N 6/) thin and moderately thick clay films on ped faces; neutral; gradual smooth boundary.

C1—45 to 54 inches; brown (10YR 5/3) silty clay loam; many medium distinct and prominent yellowish brown (10YR 5/8) mottles; massive; firm, slightly sticky and plastic; neutral; clear smooth boundary.

C2—54 to 59 inches; light olive brown (2.5Y 5/4) silt clay loam; common medium faint and distinct grayish brown (2.5Y 5/2) and yellowish red (5YR 5/8) mottles; weak thick platy varves with very thin fine sand lenses; friable, slightly sticky and plastic; neutral; clear smooth boundary.

C3—59 to 60 inches; gray (N 5/, N 6/) silty clay loam; common medium distinct light olive brown (2.5Y 5/4) and yellowish brown (10YR 5/8) mottles; weak medium platy varves with very thin fine sand lenses; firm, sticky and very plastic; mildly alkaline.

The solum is 36 to 60 inches thick. Depth to bedrock is 8 feet or more. The solum is generally free of coarse fragments but in places contains 5 percent or less. In unlimed areas reaction is strongly acid to slightly acid in the A horizon, strongly acid to neutral in the upper part of the B horizon, slightly acid to mildly alkaline in the lower part of the B horizon, and neutral to moderately alkaline in the C horizon, which may contain free carbonates.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3.

In the B2 horizon, ped faces have hue of 5Y to 10YR, value of 5 or 6, and chroma of 1 or 2; or they are neutral and have value of 5 or 6. Ped interiors have hue of 5Y to 10YR, value of 4 or 5, and chroma of 1 or 2. Mottles and coatings of various shades of gray dominate the soil volume between the base of the Ap horizon and a depth of 30 inches. Fine earth texture is silty clay loam and silty clay. Clay content in the particle-size control section averages 35 to 60 percent.

The C horizon has hue of 10YR and 2.5Y, value of 5 or 6, and chroma of 1 to 4; or it is neutral and has value of 5 or 6. Fine earth texture is loam to silty clay.

Chenango series

Soils of the Chenango series are loamy-skeletal, mixed, mesic Typic Dystrochrepts. They are deep, well drained and somewhat excessively drained soils that formed in glacial outwash derived from sandstone and siltstone. Chenango soils are on fan-shaped and linear stream terraces. Slope ranges from 0 to 8 percent.

Chenango soils are on stream terraces with well drained and somewhat excessively drained Alton soils, somewhat poorly drained and moderately drained Braceville soils, somewhat poorly drained and poorly drained Rexford soils, and somewhat poorly drained to excessively drained Udifluvents. Chenango soils contain more silt and are more acid in the particle-size control section than Alton soils. Chenango soils have a thicker solum and fewer coarse fragments in the particle-size control section than Udifluvents.

Typical pedon of Chenango gravelly loam, 0 to 8 percent slopes, in a crop field in Bradford County, Columbia Township; 2.0 miles west of Columbia Crossroads, 150 yards west of intersection with Route 08049, 200 yards west-southwest of barn, 120 yards south of telephone pole SM41:

Ap—0 to 9 inches; dark brown (10YR 3/3) gravelly loam; moderate medium and coarse granular structure; friable, slightly sticky and slightly plastic; 25 percent coarse fragments; slightly acid; clear wavy boundary.

B21—9 to 15 inches; yellowish brown (10YR 5/4) gravelly loam; moderate fine subangular blocky structure; friable, slightly sticky and slightly plastic; 25 percent coarse fragments; medium acid; clear wavy boundary.

B22—15 to 30 inches; yellowish brown (10YR 5/4) gravelly fine sandy loam; weak fine and medium granular structure; very friable, nonsticky and nonplastic; 45 percent coarse fragments; strongly acid; gradual wavy boundary.

C—30 to 60 inches; brown (10YR 5/3) very gravelly sand; single grain; loose, nonsticky and nonplastic; 60 percent coarse fragments; strongly acid.

The solum is 24 to 50 inches thick. Depth to bedrock is 8 feet or more. Coarse fragments make up 15 to 30 percent of the A horizon, 20 to 60 percent of the B horizon, and 40 to 70 percent of the C horizon. Content of coarse fragments averages more than 35 percent in the particle-size control section. In unlimed areas reaction is very strongly acid and strongly acid in the A horizon, very strongly acid to medium acid in the B horizon, and strongly acid to slightly acid in the C horizon.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 2 or 3.

The B horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 3 to 6. Fine earth texture is silt loam to fine sandy loam. Content of sand coarser than very fine sand averages less than 50 percent in the particle-size control section.

The C horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 2 to 4. Fine earth texture is loamy sand and sand.

Chippewa series

Soils of the Chippewa series are fine-loamy, mixed, mesic Typic Fragiaquepts. They are deep, poorly drained and very poorly drained soils that formed in glacial till derived from shale, siltstone, and sandstone. Chippewa soils are in upland depressions and on concave hillsides. Slope ranges from 0 to 8 percent.

Chippewa soils are on glaciated uplands with somewhat poorly drained Volusia and Morris soils and very poorly drained Medisaprists. Chippewa soils are much higher in mineral content than the organic Medisaprists.

Typical pedon of Chippewa silt loam, 3 to 8 percent slopes, in a pasture in Bradford County, Windham Township; 0.2 miles east of Windham Summit on Route 08088 to telephone pole FC4, south along fence for 700 feet, into pasture, 30 yards east of fence:

Ap—0 to 7 inches; dark grayish brown (2.5Y 4/2) silt loam; weak medium and coarse granular structure; very friable, slightly sticky and slightly plastic; 10 percent coarse fragments; medium acid; abrupt smooth boundary.

A21g—7 to 12 inches; grayish brown (10YR 5/2) silt loam; many fine faint and distinct pale brown (10YR 6/3) and strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; friable, slightly sticky and slightly plastic; 10 percent coarse fragments; medium acid; clear wavy boundary.

A22g—12 to 18 inches; gray (5Y 6/1) channery silt loam; many medium prominent very pale brown (10YR 7/3) and strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable, slightly sticky and slightly plastic; 20 percent coarse fragments; medium acid; abrupt irregular boundary.

Bx1g—18 to 31 inches; channery silt loam; grayish brown (2.5Y 5/2) prism interiors, prisms separated by gray (5Y 6/1) narrow wedges; many medium distinct and prominent strong brown (7.5YR 5/6), gray (5Y 6/1), and light yellowish brown (2.5Y 6/4) mottles; strong very coarse prismatic structure parting to moderate coarse subangular blocky; firm, brittle, slightly sticky and plastic; common fine pores lined with thin clay films; 20 percent coarse fragments; medium acid; clear wavy boundary.

Bx2g—31 to 37 inches; channery silt loam; olive brown (2.5Y 4/4) prism interiors, prisms separated by gray (5Y 6/1) narrow wedges; many coarse faint to prominent gray (5Y 6/1), strong brown (7.5YR 5/6), and grayish brown (2.5Y 5/2) mottles; strong very coarse prismatic structure parting to weak very thick platy; very firm, brittle, slightly sticky and plastic; many fine pores lined with thin clay films; 25 percent coarse fragments; slightly acid; clear wavy boundary.

Bx3g—37 to 51 inches; channery silt loam; dark brown (10YR 4/3) prism interiors, prisms separated by gray (5Y 6/1) streaks; many medium distinct gray (10YR

6/1) and yellowish brown (10YR 5/6) mottles; moderate very coarse prismatic structure; very firm, brittle, slightly sticky and slightly plastic; 25 percent coarse fragments; slightly acid; clear wavy boundary.

C—51 to 60 inches; channery silt loam; dark brown (10YR 4/3) prism interiors; common medium prominent gray (5Y 6/1) and yellowish brown (10YR 5/6) mottles; massive; very firm, nonsticky and slightly plastic; 40 percent coarse fragments; neutral.

The solum is 40 to 56 inches thick. Depth to the fragipan ranges from 14 to 20 inches. Depth to bedrock is 8 feet or more. Coarse fragments make up 0 to 15 percent of the Ap or A1 horizon, 0 to 35 percent of the A2 horizon and the B horizon above the Bx horizon, and 20 to 50 percent of the Bx and C horizons. In unlimed areas reaction is very strongly acid to slightly acid above the Bx horizon, strongly acid to neutral in the Bx horizon and medium acid to moderately alkaline in the C horizon.

The Ap horizon has hue of 10YR or 2.5Y, value of 2 to 4, and chroma of 1 or 2.

The A2 horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 or 2; or it is neutral and has value of 4 to 6. This horizon is mottled. Fine earth texture is silt loam and light silty clay loam.

The Bx horizon has hue of 10YR to 5Y, value of 3 to 6, and chroma of 1 or 2. It is mottled. Below a depth of 30 inches chroma may increase to 3 or 4. Fine earth texture is light silty clay loam to fine sandy loam.

The C horizon has hue of 10YR to 5Y, value of 3 to 6, and chroma of 1 to 4. It is mottled. Fine earth texture is light silty clay loam to fine sandy loam.

Dystrochrepts

Dystrochrepts are deep, well drained and somewhat excessively drained soils that formed in colluvium and glacial till derived from sandstone, siltstone, and shale. The soils are on sides of mountains and hills. Slope ranges from 25 to 60 percent.

Dystrochrepts are on glaciated uplands with shallow, somewhat excessively drained to moderately well drained Arnot soils; moderately deep, well drained and excessively drained Oquaga soils; moderately deep, well drained Lordstown soils; deep, moderately well drained to excessively drained Ochrepts; deep, moderately well drained Mardin soils; and deep, moderately well drained and somewhat poorly drained Wellsboro soils. Dystrochrepts have fewer stones and boulders than Ochrepts; do not have the fragipan that Mardin and Wellsboro soils have; and are deeper than Arnot, Oquaga, and Lordstown soils. Because of the variability of Dystrochrepts, a typical pedon is not given.

The solum is 30 to 60 inches thick. Depth to bedrock is more than 40 inches. Stones and boulders 1 to 10 feet in diameter cover 0 to 50 percent of the surface and make up 10 to 50 percent of the volume of individual horizons. In unlimed areas reaction ranges from extremely acid to medium acid.

The A horizon ranges from 2 to 10 inches in thickness. It has hue of 2.5Y to 7.5YR, value of 2 to 4, and chroma of 2 or 3. Fine earth texture is loam or silt loam.

The B horizon ranges from 28 to 50 inches in thickness. It has hue of 2.5Y to 5YR, value of 4 to 6, and chroma of 3 to 6. High and low chroma mottles are in the lower part of the B horizon in some pedons. Fine earth texture is loam or silt loam.

The C horizon has hue of 2.5Y to 7.5YR, value of 3 to 5, and chroma of 3 to 6. Rock fragments make up 15 to 45 percent by volume. Fine earth texture is loam or silt loam.

Holly series

Soils of the Holly series are fine-loamy, mixed, nonacid, mesic Typic Fluvaquents. They are deep, very poorly drained and poorly drained soils that formed in alluvium derived from shale, siltstone, and sandstone. Holly soils are on flood plains. Slope ranges from 0 to 3 percent.

Holly soils are on flood plains with very poorly drained Medisaprists, somewhat poorly drained to excessively drained Udifluvents, and well drained Pope and Linden soils. Holly soils are much higher in mineral content than the organic Medisaprists.

Typical pedon of Holly silt loam in an area of Holly soils, in a crop field in Bradford County, Ulster Township; 0.75 mile south of Ulster on U.S. 220, east 200 yards on farm lane across railroad, south on field road, 10 yards west of field road:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; many fine distinct brown (7.5YR 4/4) mottles; moderate medium granular structure; friable, nonsticky and slightly plastic; moderately thick silt films on peds; slightly acid; clear smooth boundary.

B21g—8 to 18 inches; dark gray (10YR 4/1) silt loam; many fine and medium distinct dark brown (7.5YR 3/2) mottles; moderate medium subangular blocky structure; friable, slightly sticky and slightly plastic; thick silt films on peds; neutral; clear wavy boundary.

B22g—18 to 37 inches; light brownish gray (10YR 6/2) silt loam; many medium and large distinct brown (10YR 4/3) mottles; weak coarse subangular blocky structure; friable, slightly sticky and slightly plastic; moderately thick silt films on peds and in pores; neutral; gradual wavy boundary.

C—37 to 60 inches; grayish brown (2.5Y 5/2) loam; many medium distinct dark brown (10YR 4/3) mottles; massive; friable, nonsticky and nonplastic; light gray (2.5Y 7/2) stratified sand lenses; neutral.

The solum is 30 to 44 inches thick. Depth to strongly contrasting material is 40 inches or more. Depth to bedrock is 8 feet or more. Coarse fragments make up 0 to 15 percent of the soil above a depth of 40 inches and 0 to 35 percent below. In unlimed areas reaction is

strongly acid to neutral above a depth of 30 inches and medium acid to neutral below.

The Ap and A1 horizons have hue of 10YR, value of 2 to 4, and chroma of 1 or 2. Fine earth texture is silt loam or loam.

The B horizon is neutral or has hue of 10YR to 5Y. Value is 4 to 6, and chroma is 2 or less. This horizon is mottled above a depth of 12 inches. If hue is 10YR or 2.5Y, value is 4 or 5 and chroma is 1. Fine earth texture is silty clay loam to sandy loam, but in some pedons this horizon has layers 4 inches or less thick that are finer or coarser in texture.

The C horizon is neutral or has hue of 10YR to 5Y. Value is 4 or 5, and chroma is 6 or less. This horizon is mottled. Fine earth texture is silt loam to sand. This horizon is stratified below a depth of 40 inches.

Linden series

Soils of the Linden series are coarse-loamy, mixed, mesic Fluventic Dystrochrepts. They are deep, well drained soils that formed in alluvium derived from shale, siltstone, and sandstone. Linden soils are on flood plains. Slope ranges from 0 to 3 percent.

Linden soils are on flood plains with very poorly drained and poorly drained Holly soils and somewhat poorly drained to excessively drained Udifluvents. Linden soils have more silt and sand in the particle-size control section than Udifluvents.

Typical pedon of Linden silt loam in an area of Linden soils, in a crop field in Bradford County, Franklin Township; 0.5 mile west of West Franklin along Pa. Hwy. 414 to gravel pit east of red barn, south of telephone pole number 142, across field, 100 feet beyond mounded hedgerow and 250 feet back from Towanda Creek:

Ap—0 to 9 inches; dark brown (7.5YR 3/2) silt loam; weak fine granular structure; friable, nonsticky and nonplastic; neutral; abrupt smooth boundary.

B21—9 to 22 inches; dark reddish brown (5YR 3/3) fine sandy loam; weak medium subangular blocky structure; friable, nonsticky and nonplastic; moderately thick silt films on peds; medium acid; gradual wavy boundary.

B22—22 to 45 inches; reddish brown (5YR 4/3) silt loam; weak coarse subangular blocky structure; friable, nonsticky and nonplastic; strongly acid; clear wavy boundary.

C—45 to 60 inches; reddish brown (5YR 4/3) sandy loam; common medium faint reddish brown (5YR 5/3) and dark reddish brown (5YR 3/4) mottles; single grain; very friable, nonsticky and nonplastic; strongly acid.

The solum is 30 to 50 inches thick. Depth to strongly contrasting material is 40 inches or more. Depth to bedrock is 8 feet or more. Coarse fragments make up 0 to 10 percent of the Ap and B2 horizons, 0 to 25 percent of the B3 horizon and the C horizon above a depth of 40 inches, and 0 to 80 percent of the C horizon below a depth of 40 inches. In unlimed areas reaction is very strongly acid to medium acid throughout.

The Ap horizon has hue of 5YR to 10YR, value of 3 or 4, and chroma of 2 to 4. Fine earth texture is silt loam, loam, and fine sandy loam.

The B horizon has hue of 2.5YR to 5YR, value of 3 to 5, and chroma of 3 or 4. Some thin layers have hue of 7.5YR. Some pedons have low-chroma mottles below a depth of 30 inches. Fine earth texture is silt loam to sandy loam.

The C horizon is neutral or has hue of 5YR to 10YR. Value is 3 to 5, and chroma is 4 or less. Fine earth texture is loam to sand above a depth of 40 inches and sandy loam to sand below. The horizon is stratified below a depth of 40 inches.

Lordstown series

Soils of the Lordstown series are coarse-loamy, mixed, mesic Typic Dystrochrepts. They are moderately deep, well drained soils that formed in glacial till derived from shale, siltstone, and sandstone. Lordstown soils are on knolls, ridges, and upper convex hillsides. Slope ranges from 3 to 25 percent.

Lordstown soils are on glaciated uplands with deep, moderately well drained Mardin soils; deep, somewhat poorly drained Volusia soils; and shallow, somewhat excessively drained to moderately well drained Arnot soils.

Typical pedon of Lordstown channery silt loam, 3 to 8 percent slopes, in a crop field in Bradford County, Ulster Township; 0.75 mile northwest of U.S. Hwy. 6 along Route 08075 to telephone pole number IU 340, 160 feet southwest of telephone pole and 250 feet north of hedgerow:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) channery silt loam; moderate medium granular structure; very friable, slightly sticky and nonplastic; 20 percent coarse fragments; slightly acid; clear wavy boundary.

B21—7 to 13 inches; light olive brown (2.5Y 5/4) channery silt loam; weak fine subangular blocky structure; very friable, slightly sticky and slightly plastic; 15 percent coarse fragments; strongly acid; clear wavy boundary.

B22—13 to 31 inches; light olive brown (2.5Y 5/4) channery silt loam; weak fine and medium subangular blocky structure; friable, slightly sticky and slightly plastic; 20 percent coarse fragments; strongly acid; clear wavy boundary.

C—31 to 34 inches; light yellowish brown (2.5Y 6/4) channery silt loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium platy structure; firm, slightly sticky and slightly plastic; 45

percent coarse fragments; strongly acid; gradual wavy boundary.
R—34 inches; olive gray (5Y 5/2) shale; very firm; very strongly acid.

The solum thickness and depth to bedrock are 20 to 40 inches. Coarse fragments make up 15 to 35 percent of the A and B horizons and 20 to 60 percent of the C horizon. Content of coarse fragments averages less than 35 percent in the particle-size control section. In unlimed areas reaction is medium acid to very strongly acid throughout.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 2 to 4.

The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6. Fine earth texture is silt loam or loam.

The C horizon, where present, has hue of 7.5YR to 5Y, value of 3 to 6, and chroma of 2 to 4. Some pedons have mottles of higher chroma. Fine earth texture is silt loam or loam.

Mardin series

Soils of the Mardin series are coarse-loamy, mixed, mesic Typic Fragiochrepts. They are deep, moderately well drained soils that formed in glacial till derived from shale, siltstone, and sandstone. Mardin soils are on hillsides and hilltops. Slope ranges from 3 to 25 percent.

Mardin soils are on glaciated uplands with deep, somewhat poorly drained Volusia soils and moderately deep, well drained Lordstown soils.

Typical pedon of Mardin channery silt loam, 3 to 8 percent slopes, in a crop field in Bradford County, Rome Township; 0.2 mile west of Rome Borough on Route 08079, 0.3 mile north on Route T740, 400 feet west of road, in field:

Ap—0 to 8 inches; dark brown (10YR 4/3) channery silt loam; moderate fine granular structure; very friable, nonsticky and slightly plastic; 20 percent coarse fragments; neutral; abrupt smooth boundary.
B1—8 to 12 inches; light olive brown (2.5Y 5/4) channery silt loam; weak fine subangular blocky structure; very friable, nonsticky and slightly plastic; 15 percent coarse fragments; slightly acid; clear wavy boundary.
B21—12 to 16 inches; yellowish brown (10YR 5/4) channery silt loam; moderate medium subangular blocky structure; friable, nonsticky and slightly plastic; 20 percent coarse fragments; medium acid; clear wavy boundary.
B22—16 to 20 inches; brown (10YR 4/3) channery silt loam; common fine faint and distinct light brownish gray (10YR 6/2), pale brown (10YR 6/3), and dark brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; friable, nonsticky and slightly plastic; 20 percent coarse fragments; strongly acid; abrupt irregular boundary.
Bx1—20 to 36 inches; channery silt loam; dark yellowish brown (10YR 4/4) prism interiors, strong brown (7.5YR 5/6) prism edges separated by light brownish gray (10YR 6/2) wedge-shaped streaks; common fine distinct light brownish gray (10YR 6/2) mottles; strong very coarse prismatic structure parting to weak very thick platy; very firm, brittle, slightly sticky and slightly plastic; many fine pores with thin clay films; 30 percent coarse fragments; strongly acid; gradual wavy boundary.
Bx2—36 to 57 inches; channery silt loam; olive brown (2.5Y 4/4) prism interiors, strong brown (7.5YR 5/6) prism edges separated by gray (5Y 6/1) streaks; common fine distinct light brownish gray (2.5Y 6/2) and dark brown (7.5YR 4/4) mottles; strong very coarse prismatic structure parting to weak coarse angular blocky; very firm, brittle, slightly sticky and plastic; common thin clay patches on peds and many fine pores lined with thick clay films; many oxide patches; 35 percent coarse fragments; very strongly acid; diffuse wavy boundary.
C—57 to 60 inches; olive brown (2.5Y 4/4) channery silt loam; common fine distinct dark brown (7.5YR 4/4) and light olive gray (5Y 6/2) mottles; massive; firm, nonsticky and slightly plastic; common oxide patches; 35 percent coarse fragments; strongly acid.

The solum is 40 to 70 inches thick. Depth to the fragipan ranges from 14 to 26 inches. Depth to bedrock is 8 feet or more. Coarse fragments make up 10 to 35 percent of the soil above the Bx horizon and 20 to 50 percent of the Bx and C horizons. In unlimed areas reaction is very strongly acid to slightly acid above the Bx horizon, very strongly acid to neutral in the Bx horizon, and strongly acid to mildly alkaline in the C horizon.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 or 4, and chroma of 2 to 4.

The B1 and B2 horizons have hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 3 to 8 and have common or many mottles in some or all parts between depths of 12 and 26 inches. Fine earth texture is silt loam or loam.

The Bx horizon has hue of 7.5YR to 2.5Y, value of 3 to 5, and chroma of 2 to 4 and has low-chroma mottles and streaks. Fine earth texture is silt loam or loam.

The C horizon has hue of 7.5YR to 5Y, value of 3 to 5, and chroma of 2 to 4 and is mottled. Fine earth texture is silt loam or loam.

Medisaprists

Medisaprists are deep, very poorly drained soils that formed in almost completely decomposed remains of herbaceous plants and mosses. They are in boggy depressional areas with poor drainage outlets and on low flood plains. They are saturated with water more than 6 months of the year. Slope ranges from 0 to 1 percent.

Medisaprists are on flood plains with very poorly drained and poorly drained Holly soils and in upland depressions with poorly drained and very poorly drained Chippewa and Norwich soils, somewhat poorly drained Volusia and Morris soils, and somewhat poorly drained to very poorly drained Aquepts. Medisaprists have more organic matter than those mineral soils. Because of the variability of Medisaprists, a typical pedon is not given.

The organic material is 16 inches to 51 inches or more thick. Well decomposed material is a major constituent of the surface and subsurface tiers but may be a minor constituent of the bottom tier. If the soil has not been limed, reaction is medium acid to neutral on flood plains and extremely acid to medium acid in depressional upland areas.

The surface tier is almost completely decomposed organic material that has granular and blocky structure. It has hue of 10YR to 5YR, value of 2 to 4, and chroma of 1 to 3.

The subsurface tier is almost completely decomposed organic material that has prismatic structure or is massive. It has hue of 5Y to 7.5YR, value of 1 or 2, and chroma of 1.

The bottom tier is layers of almost completely decomposed or partly decomposed organic material that has prismatic structure or is massive. It has hue of 5Y to 7.5YR, value of 1 or 2, and chroma of 1. Woody fragments make up as much as 10 percent by volume.

The underlying glacial till, lakebed sediment, or bedrock is at a depth of more than 16 inches. The glacial till and lakebed sediment are silty clay loam, loam, or sandy loam. This material has hue of 5Y or 2.5Y, value of 4 to 7, and chroma of 1 or 2; or it is neutral and has value of 4 to 7.

Morris series

Soils of the Morris series are coarse-loamy, mixed, mesic Aeric Fragiaquepts. They are deep, somewhat poorly drained soils that formed in glacial till derived from shale, siltstone, and sandstone. Morris soils are on concave hillsides, plateaus, and tops and sides of mountains. Slope ranges from 3 to 25 percent.

Morris soils are on glaciated uplands with deep, moderately well drained and somewhat poorly drained Wellsboro soils; deep, very poorly drained and poorly drained Norwich soils; deep, somewhat poorly drained to very poorly drained Aquepts; and moderately deep, well drained and somewhat excessively drained Oquaga soils.

Typical pedon of Morris channery silt loam in an area of Morris very stony silt loam, 3 to 8 percent slopes, in woodland in Sullivan County, Shrewbury Township, on Wyoming State Forest land; 5 miles east of Hillsgrove Ranger Station on Forest Road along Dry Run, 100 yards west of intersection with McCarty Road, 10 feet south into woods:

O1—2 to 0 inches; black (N 2/) fibrous root mat with some charred wood particles; strong medium granular structure; very friable, nonsticky and nonplastic; medium acid; abrupt smooth boundary.

A2—0 to 3 inches; light reddish brown (5YR 6/3) channery silt loam; strong fine granular structure; very friable, slightly sticky and slightly plastic; 15 percent coarse fragments; strongly acid; clear wavy boundary.

B1—3 to 7 inches; reddish brown (5YR 5/3) channery silt loam; common medium faint and distinct pinkish gray (5YR 6/2), light reddish brown (5YR 6/3), and reddish yellow (7.5YR 6/8) mottles; strong fine subangular blocky structure; friable, slightly sticky and slightly plastic; 15 percent coarse fragments; strongly acid; clear wavy boundary.

B2—7 to 16 inches; pinkish gray (7.5YR 6/2) silt loam; many medium prominent reddish brown (5YR 5/3) and reddish yellow (7.5YR 6/8) mottles; moderate medium subangular blocky structure; friable, slightly sticky and slightly plastic; 10 percent coarse fragments; strongly acid; abrupt irregular boundary.

Bx—16 to 52 inches; channery silt loam; reddish brown (2.5YR 4/4) ped interiors, yellowish red (5YR 5/6) prism edges separated by pinkish gray (5YR 7/2) and light gray (5YR 6/1) wedge-shaped streaks; strong very coarse prismatic structure parting to weak very thick platy; very firm, brittle, slightly sticky and plastic; common fine pores lined with thick clay films; 30 percent coarse fragments; medium acid; diffuse wavy boundary.

C—52 to 60 inches; reddish brown (2.5YR 4/4) channery silt loam; common fine prominent pinkish gray (5YR 7/2) mottles; massive; very firm, slightly sticky and plastic; common fine pores lined with moderately thick clay films; 30 percent coarse fragments; slightly acid.

The solum is 40 to 65 inches thick. Depth to the fragipan ranges from 13 to 22 inches. Depth to bedrock is 3.5 to 8 feet or more. Coarse fragments make up 10 to 35 percent of the soil above the Bx horizon and 15 to 50 percent of the Bx and C horizons. In unlimed areas reaction is very strongly acid to medium acid in the A and B2 horizons and the upper part of the Bx horizon, and strongly acid to slightly acid in the lower part of the Bx horizon and in the C horizon.

The Ap horizon has hue of 5YR to 10YR, value of 3 or 4, and chroma of 1 to 4.

The A2 and B1 horizons have hue of 5YR to 10YR, value of 3 to 6, and chroma of 2 or 3. Fine earth texture is silt loam or loam.

In some part of the B2 horizon above a depth of 20 inches the dominant color has hue of 5YR to 10YR, value of 5 to 7, and chroma of 1 or 2, but individual horizons may have hue of 5YR to 10YR, value of 3 to 6, and chroma of 2 to 6. This horizon is mottled. Fine earth texture is silt loam or loam.

The Bx horizon has hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 2 to 6 with low-chroma mottles or streaks. Fine earth texture is loam to light silty clay loam.

The C horizon has hue of 2.5YR to 5YR, value of 4 to 6, and chroma of 3 to 6 and is mottled. Fine earth texture is loam or silt loam.

Norwich series

Soils of the Norwich series are fine-loamy, mixed, mesic Typic Fragiaquepts. They are deep, very poorly drained and poorly drained soils that formed in glacial till derived from shale, siltstone, and sandstone. Norwich soils are in depressions on mountaintops and on concave side slopes near drainageways. Slope ranges from 0 to 8 percent.

Norwich soils are on glaciated uplands with moderately well drained and somewhat poorly drained Wellsboro soils, somewhat poorly drained Morris soils, somewhat poorly drained to very poorly drained Aquepts, and very poorly drained Medisaprists. Norwich soils contain fewer coarse fragments and stones than Aquepts and have higher mineral content than the organic Medisaprists.

Typical pedon of Norwich channery silt loam in an area of Norwich very stony silt loam, 0 to 8 percent slopes, in woodland in Sullivan County, Shrewsbury Township, Wyoming State Forest land; northwest of Eagles Mere on Dry Run Road, 0.4 miles west of Route 56005, east side of swamp, 12 yards north of road in backhoe pit:

O1—3 inches to 0; dark reddish brown (5YR 2/2) disintegrated leaves; very friable, nonsticky and nonplastic; very strongly acid; abrupt smooth boundary.

A1—0 to 4 inches; black (10YR 2/1) channery silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic; 15 percent coarse fragments; strongly acid; clear smooth boundary.

A21g—4 to 17 inches; light gray (5YR 6/1) channery silt loam; common coarse prominent yellowish brown (10YR 5/6) mottles; weak moderate subangular blocky and weak thin platy structure; friable, nonsticky and slightly plastic; 15 percent coarse fragments; strongly acid; abrupt wavy boundary.

A22g—17 to 20 inches; pinkish gray (5YR 6/2) channery loam; many coarse prominent strong brown (7.5YR 5/6) mottles; moderate medium platy structure; friable, nonsticky and nonplastic; 10 percent coarse fragments; strongly acid; abrupt irregular boundary.

Bx1—20 to 31 inches; channery loam; reddish gray (5YR 5/2) prism interiors, pinkish gray (5YR 6/2) wedge-shaped streaks; common medium to large distinct reddish brown (5YR 5/4) and reddish yellow (7.5YR 6/6) mottles; strong very coarse prismatic structure; very firm, brittle, slightly sticky and slightly plastic; 20 percent coarse fragments; strongly acid; gradual wavy boundary.

Bx2—31 to 53 inches; channery loam; reddish gray (5YR 5/2) and reddish brown (5YR 5/3) prism interiors; many large faint and distinct gray (5YR 6/1), pinkish gray (5YR 6/2), and reddish brown (5YR 5/4) mottles; gray (5YR 6/1) streaks; strong very coarse prismatic structure; very firm, brittle, slightly sticky and slightly plastic; 20 percent coarse fragments; strongly acid; diffuse wavy boundary.

C—53 to 60 inches; reddish brown (5YR 5/3) channery loam; common medium distinct gray (5YR 6/1), pinkish gray (5YR 6/2), and reddish brown (5YR 5/4) mottles; weak very thick platy structure; firm, slightly sticky and slightly plastic; 20 percent coarse fragments; medium acid.

The solum is 36 to 55 inches thick. Depth to the fragipan ranges from 12 to 24 inches. Depth to bedrock is 3.5 to 8 feet or more. Coarse fragments make up 10 to 35 percent of the soil above the Bx horizon and 15 to 45 percent of the Bx and C horizons. In unlimed areas reaction is strongly acid to medium acid above the Bx horizon and strongly acid to slightly acid in the Bx and C horizons.

The A1 horizon has hue of 7.5YR or 10YR, value of 2 to 4, and chroma of 1 or 2.

The A2 horizon has hue of 10YR to 2.5YR, value of 5 or 6, and chroma of 1 or 2. It is mottled. Fine earth texture is silt loam or loam.

The Bx horizon has hue of 7.5YR to 2.5YR, value of 4 or 5, and chroma of 1 or 2. It is mottled. Below a depth of 30 inches chroma may increase to 3. Fine earth texture is loam, silt loam, and sandy loam.

The C horizon has hue of 7.5YR to 2.5YR, value of 4 or 5, and chroma of 1 to 3. It is mottled. Fine earth texture is sandy loam or loam.

Ochrepts

Ochrepts are moderately deep and deep, moderately well drained to excessively drained soils that formed in a layer that is mostly stones and boulders and in the underlying glacial till and colluvium derived from sandstone and siltstone. The soils are on sides of mountains and hills. Slope ranges from 15 to 100 percent.

Ochrepts are on glaciated uplands with shallow, somewhat excessively drained to moderately well drained Arnot soils; moderately deep, well drained and somewhat excessively drained Oquaga soils; moderately deep, well drained Lordstown soils; and deep, well drained and somewhat excessively drained Dystrochrepts. Ochrepts contain more boulders, stones, and coarse fragments than those soils. Because of the variability of Ochrepts, a typical pedon is not given.

The solum is 20 to 50 inches or more thick. Boulders and stones cover 90 to 100 percent of the surface and range from 1 to 20 feet in diameter. The layer of boulders, stones, and pebbles is 2 to 8 feet thick and is underlain by colluvium, glacial till, or bedrock. Depth to bedrock is more than 20 inches. The organic leaf and

root mat is 4 to 18 inches thick. Boulders, stones, and pebbles make up 50 to 75 percent of the volume of the individual horizons. The fine earth fraction is extremely acid to strongly acid throughout. A fragipan is present in some pedons.

The A horizon ranges from 4 to 15 inches in thickness. The space between the rock fragments consists mostly of leaf litter, roots, decaying organic matter, water, and air. Less than 10 percent by volume is fine earth material. The fine earth material has hue of 7.5YR or 10YR, value of 2 to 4, and chroma of 2 or 3. Texture is sandy loam, loam, and silt loam.

The B horizon ranges from 12 to 40 inches or more in thickness. The space between the rock fragments consists of roots, decaying organic matter, water, air, and soil. Less than 30 percent by volume is fine earth material. The fine earth material has hue of 5YR to 10YR, value of 4 to 6, and chroma of 2 or 3. High- and low-chroma mottles are in the lower part of this horizon in some pedons.

The C horizon has hue of 2.5Y to 7.5YR, value of 3 to 5, and chroma of 3 to 6. Rock fragments, mostly smaller than 1 foot in diameter, make up 50 to 75 percent of the glacial till and colluvium. Fine earth texture is silt loam, loam, and sandy loam.

Oquaga series

Soils of Oquaga series are loamy-skeletal, mixed, mesic Typic Dystrochrepts. They are moderately deep, well drained and somewhat excessively drained soils that formed in glacial till derived from shale, siltstone, and sandstone. Oquaga soils are on ridges, upper convex hillsides, mountainsides, and mountaintops. Slope ranges from 3 to 60 percent.

Oquaga soils are on glaciated uplands with shallow, somewhat excessively drained to moderately well drained Arnot soils; deep, moderately well drained and somewhat poorly drained Wellsboro soils; and deep, somewhat poorly drained Morris soils.

Typical pedon of Oquaga channery silt loam, 8 to 15 percent slopes (fig. 8), in a shale pit in Bradford County, Albany Township; 2.2 miles west of New Albany on Route 08008 to shale pit on north side of road; north face of shale pit:

Ap—0 to 7 inches; dark reddish brown (5YR 3/3) channery silt loam; moderate fine and medium granular structure; very friable, slightly sticky and slightly plastic; 15 percent coarse fragments; strongly acid; abrupt smooth boundary.

B1—7 to 9 inches; reddish brown (5YR 4/4) channery silt loam; moderate fine and medium granular structure; friable, sticky and plastic; 25 percent coarse fragments; strongly acid; clear wavy boundary.

B21—9 to 19 inches; reddish brown (5YR 4/4) channery loam; weak fine subangular blocky structure; friable, slightly sticky and slightly plastic; 40 percent coarse fragments; strongly acid; clear wavy boundary.

B22—19 to 25 inches; reddish brown (5YR 4/4) very shaly loam; weak medium subangular blocky structure; firm, slightly sticky and nonplastic; 60 percent coarse fragments; strongly acid; gradual wavy boundary.

C—25 to 32 inches; reddish brown (5YR 4/3) very shaly loam; weak medium platy structure; firm, slightly sticky and nonplastic; 75 percent coarse fragments; strongly acid; diffuse wavy boundary.

R—32 inches; dusky red (2.5YR 3/2) shale and thin-bedded sandstone; medium acid.

The solum is 15 to 35 inches thick. Depth to bedrock is 20 to 40 inches. Coarse fragments make up 15 to 45 percent of the A horizon, 25 to 60 percent of the B horizon, and 35 to 90 percent of the C horizon. Content of coarse fragments averages more than 35 percent in

Figure 8.—Profile of Oquaga channery silt loam, 8 to 15 percent slopes, showing 2 to 3 feet of channery silt loam and very shaly loam over interbedded shale and sandstone bedrock.

the particle-size control section. In unlimed areas reaction is very strongly acid to medium acid throughout.

The Ap horizon has hue of 2.5YR to 7.5YR, value of 3 or 4, and chroma of 2 to 4.

The B horizon has hue of 2.5YR to 7.5YR, value of 3 to 5, and chroma of 4 to 6. Fine earth texture is silt loam and loam.

The C horizon, where present, has hue of 2.5YR to 7.5YR, value of 3 to 5, and chroma of 2 to 4. Fine earth texture is loam and silt loam.

Pope series

Soils of the Pope series are coarse-loamy, mixed, mesic Fluventic Dystrochrepts. They are deep, well drained soils that formed in alluvium derived from shale, siltstone, and sandstone. Pope soils are on flood plains. Slope ranges from 0 to 3 percent.

Pope soils are on flood plains with very poorly drained and poorly drained Holly soils and somewhat poorly drained to excessively drained Udifluvents. Pope soils have more sand and silt in the particle-size control section than Udifluvents.

Typical pedon of Pope silt loam in an area of Pope soils in a crop field in Bradford County, North Towanda Township; on route 08191, one mile west of intersection with U.S. Hwys. 6 and 220, 300 yards south of road:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam; moderate coarse granular structure; friable, slightly sticky and slightly plastic; neutral; abrupt smooth boundary.

B1—10 to 19 inches; brown (10YR 5/3) loam; weak thick platy structure grading downward to moderate medium subangular blocky; friable, slightly sticky and slightly plastic; moderately thick silt films on ped faces; neutral; clear wavy boundary.

B21—19 to 26 inches; brown (10YR 5/3) loam; moderate medium and coarse subangular blocky structure; friable, slightly sticky and slightly plastic; medium acid; clear wavy boundary.

B22—26 to 40 inches; dark brown (10YR 4/3) sandy loam; weak coarse subangular blocky structure; friable, slightly sticky and nonplastic; strongly acid; abrupt smooth boundary.

C1—40 to 46 inches; dark brown (10YR 4/3) loamy sand; few medium faint light brownish gray (10YR 6/2) mottles; single grain; very friable, nonsticky and nonplastic; strongly acid; abrupt smooth boundary.

C2—46 to 60 inches; pale brown (10YR 6/3) sandy loam; common medium distinct brown (7.5YR 4/2) and yellowish red (5YR 4/6) mottles; massive; friable, slightly sticky and nonplastic; light gray (10YR 7/2) uncoated sand lenses; strongly acid.

The solum is 30 to 50 inches thick. Depth to strongly contrasting material is 40 inches or more. Depth to bedrock is 8 feet or more. Content of coarse fragments ranges from 0 to 30 percent above a depth of about 40 inches and from 0 to 60 percent below. In unlimed areas reaction is strongly acid and very strongly acid throughout.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. Fine earth texture is silt loam, loam, and sandy loam.

The B horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. Some pedons have low-chroma mottles below a depth of 24 inches. Fine earth texture is silt loam to sandy loam.

The C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. Fine earth texture is loam to loamy sand. Stratification begins below a depth of 40 inches.

Rexford series

Soils of the Rexford series are coarse-loamy, mixed, mesic Aeric Fragiaquepts. They are deep, somewhat poorly drained and poorly drained soils that formed in glacial outwash derived from sandstone and shale. Rexford soils are on stream terraces and on sides of valleys. Slope ranges from 0 to 12 percent.

Rexford soils are on terraces with well drained and somewhat excessively drained Chenango and Alton soils, somewhat excessively drained Wyoming soils, and somewhat poorly drained and moderately well drained Braceville soils.

Typical pedon of Rexford silt loam, 3 to 8 percent slopes, in a crop field in Bradford County, Canton Township; northeast of Canton, 0.2 mile west of Route 08040 on Route T323, 50 yards south into field:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; very friable, slightly sticky and slightly plastic; 10 percent coarse fragments; slightly acid; abrupt smooth boundary.

B21—8 to 11 inches; yellowish brown (10YR 5/4) silt loam; many medium distinct light brownish gray (10YR 6/2) mottles; moderate fine subangular blocky structure; friable, slightly sticky and slightly plastic; 10 percent coarse fragments; medium acid; clear wavy boundary.

B22—11 to 18 inches; grayish brown (10YR 5/2) silt loam; many medium distinct strong brown (7.5YR 5/6) and gray (N 6/) mottles; moderate medium subangular blocky structure; friable, slightly sticky and slightly plastic; 10 percent coarse fragments; strongly acid; abrupt wavy boundary.

IIBx—18 to 42 inches; gravelly loam; dark brown (7.5YR 4/4) prism interiors, yellowish brown (10YR 5/8) prism edges separated by gray (10YR 6/1) wedges; many medium distinct and prominent reddish brown (5YR 4/4) and gray (10YR 6/1) mottles; strong very coarse prismatic structure parting to weak thick platy; firm and very firm, brittle, slightly sticky and

slightly plastic; 20 percent coarse fragments; strongly acid; clear wavy boundary.

IIIC—42 to 60 inches; reddish brown (5YR 4/3) gravelly sandy loam; common medium prominent gray (10YR 6/1) mottles; single grain; very friable, nonsticky and nonplastic; stratified; 40 percent coarse fragments; strongly acid.

The solum is 30 to 50 inches thick. Stratified layers of sand and gravel are at a depth of 35 to 72 inches. Depth to the fragipan ranges from 15 to 24 inches. Depth to bedrock is 8 feet or more. Coarse fragments make up 0 to 35 percent of the A, B2, and Bx horizons, and sand and gravel is below a depth of 35 inches in the C horizon. In unlimed areas reaction is strongly acid and medium acid above the Bx horizon and strongly acid to slightly acid in the Bx and C horizons.

The Ap horizon has hue of 10YR, value of 4, and chroma of 1 or 2.

The B2 horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 2 to 6. Low chroma is dominant within 6 to 12 inches of the surface. Fine earth texture is silt loam to sandy loam.

The Bx horizon has hue of 5YR to 2.5Y, value of 4 to 6, and chroma of 1 to 4. Low chroma is dominant. Fine earth texture is silt loam to sandy loam.

The C horizon has hue of 5YR to 5Y, value of 4 to 6, and chroma of 1 to 4. Fine earth texture is silt loam to sand.

Udifluvents

Udifluvents are deep, somewhat poorly drained to excessively drained soils that formed in stratified alluvium derived from siltstone and sandstone. They are on flood plains and alluvial fans that are constantly receiving cobles, gravel, sand, and other sediment. Channel-bank erosion and the formation of gravel bars is common during intense storms and spring thaws. Slope ranges from 0 to 3 percent.

Udifluvents are on flood plains with well drained Linden and Pope soils and very poorly drained and poorly drained Holly soils. Udifluvents have more sand and coarse fragments than those soils. Because of the variability of Udifluvents, a typical pedon is not given.

Depth to bedrock is 8 feet or more. In unlimed areas reaction is very strongly acid to medium acid throughout. Coarse fragments of gravel and cobbles make up 0 to 80 percent of the invdividual layers.

The A horizon ranges form 0 to 10 inches in thickness. It has hue of 5YR to 10YR, value of 2 to 4, and chroma of 2 to 4. Fine earth texture is loam to very coarse sand.

The stratified C horizon extends to a depth of 60 inches or more. It has hue of 5YR to 10YR, value of 3 to 6, and chroma of 2 to 4. Some mottles with chroma of 2 or less are above a depth of 20 inches in some pedons. Fine earth texture is loam to very coarse sand.

Udorthents

Udorthents are deep, moderately well drained to excessively drained soils that formed in excavated and mixed broken rock and fine earth material that remained after coal was removed during open pit strip mining. These soils are on glaciated mountaintops and plateaus. Slope ranges from 3 to 60 percent.

Udorthents are on glaciated uplands with moderately deep, well drained and somewhat excessively drained Oquaga soils; deep, moderately well drained and somewhat poorly drained Wellsboro soils; deep, somewhat poorly drained Morris soils; and deep, very poorly drained and poorly drained Norwich soils. Udorthents have more rock fragments than those soils. Udorthents do not have distinct horizon development. Because of the variability of Udorthents, a typical pedon is not given.

Depth to bedrock is 8 feet or more. Rock fragments make up 40 to 100 percent of the individual layers. In unlimed areas reaction is extremely acid to neutral throughout.

The A horizon ranges from 0 to 10 inches in thickness. It has hue of 7.5YR to 2.5Y, value of 2 to 5, and chroma of 2 to 6. Fine earth texture is silty clay loam to loamy sand. There is some aggregation of the individual soil particles by the fibrous roots of plants.

The C horizon has hue of 2.5YR to 5Y, value of 2 to 7, and chroma of 1 to 4. Fine earth texture is silty clay loam to loamy sand to a depth of 60 inches or more.

Unadilla series

Soils of the Unadilla series are coarse-silty, mixed, mesic Typic Dystrochrepts. They are deep, well drained soils that formed in water- and wind-deposited material high in coarse silt and very fine sand and in the underlying glacial till or sand and gravel. Unadilla soils are on stream terraces near major streams and on uplands adjacent to the stream terraces. Slope ranges from 3 to 15 percent.

Unadilla soils are on stream terraces with well drained and somewhat excessively drained Alton and Chenango soils, somewhat poorly drained and moderately well drained Braceville soils, and somewhat poorly drained and poorly drained Rexford soils. They are on nearby uplands with moderately well drained Mardin soils and somewhat poorly drained Volusia soils. Unadilla soils have fewer coarse fragments in the particle-size control section than Alton and Chenango soils.

Typical pedon of Unadilla silt loam, 3 to 8 percent slopes, in a crop field in Bradford County, Sheshequin Township; 5 miles west on Route 08138 from intersection with Route 08077, south on private field lane 300 yards, 30 yards east into field:

Ap—0 to 10 inches; dark brown (10YR 4/3) silt loam; moderate fine and medium granular structure;

friable, slightly sticky and slightly plastic; slightly acid; abrupt smooth boundary.

B21—10 to 28 inches; yellowish brown (10YR 5/4) very fine sandy loam; moderate fine and medium subangular blocky structure; friable, slightly sticky and nonplastic; common thin very pale brown (10YR 7/3) very fine sand lenses; medium acid; gradual wavy boundary.

B22—28 to 36 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable, slightly sticky and slightly plastic; common thin pale brown (10YR 6/3) very fine sand lenses; 1 percent coarse fragments; strongly acid; clear wavy boundary.

C1—36 to 55 inches; light olive brown (2.5Y 5/4) very fine sandy loam; common medium distinct light gray (10YR 7/1) mottles; weak medium platy structure; friable, nonsticky and nonplastic; 5 percent coarse fragments; strongly acid; abrupt smooth boundary.

IIC2—55 to 60 inches; light olive brown (2.5Y 5/4) channery loam; common medium distinct light brownish gray (2.5Y 6/2) mottles; massive; firm, slightly sticky and slightly plastic; 20 percent coarse fragments; strongly acid.

The solum is 30 to 50 inches thick. Depth to bedrock or strongly contrasting materials is 40 inches or more. Coarse fragments make up 0 to 5 percent of the A, B, and C horizons above the IIC horizon and 0 to 60 percent of the IIC horizon. The fine earth fraction is dominantly silt and very fine sand with less than 15 percent fine or coarser sand and less than 18 percent clay in the particle-size control section. In unlimed areas reaction is very strongly acid to medium acid in the A and B horizons and strongly acid to mildly alkaline in the C1 and IIC horizons. Some pedons have mottles below a depth of 24 inches.

The Ap horizon has hue of 7.5YR to 2.5Y, value of 3 to 5, and chroma of 2 to 4.

The B horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 4 to 6. Fine earth texture is silt loam and very fine sandy loam. Thin lamellae are in some pedons.

The C1 and IIC horizons have hue of 7.5YR to 5Y, value of 4 or 5, and chroma of 2 to 4. Fine earth texture is silt loam and very fine sandy loam above a depth of 40 inches and silty clay loam to sand below.

Volusia series

Soils of the Volusia series are fine-loamy, mixed, mesic Aeric Fragiaquepts. They are deep, somewhat poorly drained soils that formed in glacial till derived from shale, siltstone, and sandstone. Volusia soils are on hilltops and concave hillsides. Slope ranges from 3 to 25 percent.

Volusia soils are on glaciated uplands with deep, moderately well drained Mardin soils; deep, poorly drained and very poorly drained Chippewa soils; and moderately deep, well drained Lordstown soils.

Typical pedon of Volusia channery silt loam, 3 to 8 percent slopes, in a crop field in Bradford County, Orwell Township; 1.0 mile south of North Orwell on Pa. Hwy. 187, 0.3 mile east on Route T723, 0.5 mile north on Route T725, 150 feet west of trailer home towards corner of woods:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) channery silt loam; weak medium granular structure; friable, nonsticky and slightly plastic; 20 percent coarse fragments; slightly acid; abrupt smooth boundary.

B21—8 to 11 inches; light yellowish brown (2.5Y 6/4) channery silt loam; common faint and distinct medium light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable, slightly sticky and slightly plastic; 30 percent coarse fragments; slightly acid; clear wavy boundary.

B22—11 to 14 inches; light brownish gray (2.5Y 6/2) channery silt loam; many medium faint and distinct gray (10YR 6/1) and yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; friable, nonsticky and slightly plastic; 30 percent coarse fragments; medium acid; clear wavy boundary.

Bx1—14 to 21 inches; channery loam; light olive brown (2.5Y 5/4) prism interiors, yellowish brown (10YR 5/6) prism edges separated by light brownish gray (2.5Y 6/2) wedge-shaped streaks; many medium prominent strong brown (7.5YR 5/8) and light brownish gray (2.5Y 6/2) mottles; strong very coarse prismatic structure parting to moderate medium subangular blocky; very firm, brittle, slightly sticky and slightly plastic; few thin clay patches on peds; 25 percent coarse fragments; medium acid; gradual wavy boundary.

Bx2—21 to 38 inches; channery clay loam; light olive brown (2.5Y 5/4) prism interiors, yellowish brown (10YR 5/6) prism edges separated by light brownish gray (2.5Y 6/2) wedge-shaped streaks; common medium distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/8) mottles; strong very coarse prismatic structure parting to moderate medium subangualr blocky; very firm, brittle, slightly sticky and slightly plastic; many thin clay patches on peds; 30 percent coarse fragments; medium acid; gradual wavy boundary.

Bx3—38 to 50 inches; channery clay loam; dark brown (10YR 4/3) prism interiors, yellowish brown (10YR 5/6) prism edges separated by light brownish gray (2.5Y 6/2) streaks; few fine faint light brownish gray (10YR 6/2) and yellowish brown (10YR 5/4) mottles; weak very coarse prismatic structure parting to weak medium subangular blocky; very firm, brittle, nonsticky and slightly plastic; common thin clay

patches on peds and many fine pores lined with moderately thick clay films; 30 percent coarse fragments; slightly acid; gradual wavy boundary.

C—50 to 60 inches; olive brown (2.5Y 4/4) channery silt loam; few fine distinct pale brown (10YR 6/3) and yellowish brown (10YR 5/6) mottles; massive; firm, nonsticky and slightly plastic; many fine pores lined with thin clay films; 35 percent coarse fragments; neutral.

The solum is 40 to 72 inches thick. Depth to the fragipan ranges from 10 to 20 inches. Depth to bedrock is 3.5 feet to 8 feet or more. Coarse fragments make up 10 to 30 percent of the A, B2, and Bx horizons and 10 to 60 percent of the C horizon. In unlimed areas reaction is strongly acid to slightly acid in the A and B2 horizons and the upper part of the Bx horizon, strongly acid to neutral in the lower part of the Bx horizon, and medium acid to moderately alkaline in the C horizon.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 2 or 3.

The B2 horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. It has mottles. Chroma of 2 or less dominates part of the B2 horizon above 20 inches. Fine earth texture is silt loam or loam.

The Bx horizon has hue of 10YR to 5Y, value of 3 to 5, and chroma of 2 to 4. It has low chroma mottles and streaks. Fine earth texture is loam to silty clay loam.

The C horizon has hue of 10YR to 5Y, value of 3 to 5, and chroma of 2 to 4. It is mottled. Fine earth texture is loam or silt loam.

Wellsboro series

Soils of the Wellsboro series are coarse-loamy, mixed, mesic Typic Fragiochrepts. They are deep, moderately well drained and somewhat poorly drained soils that formed in glacial till derived from shale, siltstone, and sandstone. Wellsboro soils are on convex hillsides, hilltops, mountaintops, and plateaus. Slope ranges from 3 to 25 percent.

Wellsboro soils are on glaciated uplands with moderately deep, well drained and somewhat excessively drained Oquaga soils and deep, somewhat poorly drained Morris soils.

Typical pedon of Wellsboro channery silt loam, 3 to 8 percent slopes, in a hayfield in Sullivan County, Cherry Township; 0.9 mile from Dushore on Pa. Hwy. 487 to Route T474, on Route T474 to Route T407 (East Cherry Street extension), 50 yards from telephone pole HC9 along Route R407, 30 yards southeast into field:

Ap—0 to 8 inches; dark brown (7.5YR 3/2) channery silt loam; moderate fine granular structure; very friable, slightly sticky and slightly plastic; 20 percent coarse fragments; slightly acid; abrupt smooth boundary.

B21—8 to 14 inches; reddish brown (5YR 5/4) channery silt loam; moderate fine subangular blocky structure; friable, sticky and plastic; 15 percent coarse fragments; medium acid; clear wavy boundary.

B22—14 to 20 inches; reddish brown (5YR 4/3) channery silt loam; many medium distinct pinkish gray (7.5YR 6/2), dark reddish brown (5YR 3/4), and yellowish red (5YR 5/6) mottles; moderate medium subangular blocky structure; friable, slightly sticky and slightly plastic; 15 percent coarse fragments; medium acid; abrupt coarse fragments; medium acid; abrupt irregular boundary.

Bx1—20 to 35 inches; channery loam; dark reddish brown (5YR 3/4) prism interiors, strong brown (7.5YR 5/6) edges separated by pinkish gray (5YR 6/2) wedge-shaped streaks; strong very coarse prismatic structure parting to weak and moderate thick platy; very firm, brittle, slightly sticky and slightly plastic; 25 percent coarse fragments; strongly acid; diffuse wavy boundary.

Bx2—35 to 52 inches; channery loam; dark reddish brown (5YR 3/4) prism interiors, strong brown (7.5YR 5/6) edges separated by pale red (2.5YR 6/2) streaks; strong very coarse prismatic structure parting to weak coarse subangular blocky; very firm, brittle, slightly sticky and slightly plastic; many fine pores lined with thin clay films; 25 percent coarse fragments; strongly acid; gradual wavy boundary.

C—52 to 60 inches; dark reddish brown (5YR 3/4) channery loam; common medium pale red (2.5YR 6/2) mottles; weak very thick platy structure; very firm, slightly sticky and slightly plastic; 35 percent coarse fragments; medium acid.

The solum is 40 to 75 inches thick. Depth to the fragipan ranges from 15 to 26 inches. Depth to bedrock is 3.5 feet to 8 feet or more. Coarse fragments make up 10 to 40 percent of this soil above the Bx horizon and 15 to 40 percent of the Bx and C horizons. In unlimed areas reaction is very strongly acid to medium acid throughout.

The Ap horizon has hue of 5YR to 10YR, value of 3 or 4, and chroma of 2 or 3. The A2 horizon has hue of 5YR to 10YR, value of 3 to 6, and chroma of 2 or 3.

The B2 horizon has hue of 2.5YR to 10YR, value of 4 or 5, and chroma of 3 to 6. It has low-chroma mottles below a depth of 12 inches. Fine earth texture is silt loam or loam.

A thin fine sandy loam, loam, or silt loam A'2 horizon is above the fragipan in some pedons.

The Bx horizon has hue of 2.5YR or 5YR, value of 3 to 5, and chroma of 2 to 4. It has low-chroma mottles or streaks. Fine earth texture is sandy loam to silt loam.

The C horizon has hue of 2.5YR or 5YR, value of 3 to 5, and chroma of 2 to 4. It is mottled. Fine earth texture is sandy loam to silt loam.

Wyoming series

Soils of the Wyoming series are loamy-skeletal, mixed, mesic typic Dystrochrepts. They are deep, somewhat

excessively drained soils that formed in glacial outwash derived from sandstone and siltstone. Wyoming soils are on stream terraces, terraces on valley sides, eskers, and kames. Slope ranges from 3 to 45 percent.

Wyoming soils are on glacial and stream terraces with well drained to somewhat excessively drained Chenango soils, somewhat poorly drained and moderately well drained Braceville soils, and somewhat poorly drained and poorly drained Rexford soils. Wyoming soils contain more sand in the particle-size control section than Chenango soils.

Typical pedon of Wyoming gravelly sandy loam, 8 to 15 percent slopes in a gravel pit in Bradford County, Terry Township; on Route T417 about 100 yards from Route 08010 to gravel pit, northeast to east side of gravel pit:

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) gravelly sandy loam; moderate fine granular structure; very friable, nonsticky and nonplastic; 30 percent coarse fragments; medium acid; abrupt smooth boundary.

A2—2 to 9 inches; dark brown (10YR 4/3) gravelly sandy loam; moderate medium and coarse granular structure; very friable, slightly sticky and nonplastic; 30 percent coarse fragments; very strongly acid; clear wavy boundary.

B2—9 to 15 inches; brown (10YR 4/3) gravelly sandy loam; moderate fine granular and very fine subangular blocky structure; very friable, nonsticky and nonplastic; 40 percent coarse fragments; strongly acid; gradual wavy boundary.

B3—15 to 26 inches; dark brown (10YR 4/3) very gravelly coarse sandy loam; weak medium subangular blocky structure; very friable, nonsticky and nonplastic; 50 percent coarse fragments; strongly acid; clear wavy boundary.

IIC1—26 to 34 inches; dark brown (10YR 4/3) gravelly sand; single grain; loose, nonsticky and nonplastic; 35 percent coarse fragments; strongly acid; abrupt wavy boundary.

IIIC2—34 to 60 inches; dark brown (10YR 4/3) very gravelly sand; single grain; loose, nonsticky and nonplastic; 70 percent coarse fragments; medium acid.

The solum is 18 to 35 inches thick. Depth to bedrock is 10 feet or more. Coarse fragments make up 15 to 50 percent of the A horizon, 20 to 60 percent of the B2 horizon, and 35 to 75 percent of the B3 and C horizons. Content of coarse fragments averages more than 35 percent in the particle-size control section. The fine earth fraction is more than 50 percent fine sand to coarse sand in the particle-size control section. In unlimed areas reaction is very strongly acid to medium acid throughout.

The A1, A2, and Ap horizons have hue of 10YR to 5YR, value of 3 to 5, and chroma of 2 to 4.

The B horizon has hue of 10YR to 2.5YR, value of 4 or 5, and chroma of 3 or 4. Fine earth texture is coarse sandy loam to fine sandy loam.

The C horizon has hue to 10YR to 2.5YR, value of 4 or 5, and chroma of 2 to 4. Fine earth texture is sandy loam above a depth of 25 inches but ranges to sand below.

formation of the soils

This section describes the formation of the soils in Bradford and Sullivan Counties. The first part explains the factors of soil formation; the second part explains the processes of soil formation; and the third part explains horizon nomenclature.

factors of soil formation

Soils are complex mixtures of weathered rock, minerals, organic matter, water, and air. Soils form through the chemical and physical weathering of geologic materials. The extent of the weathering and the characteristics of any soil that develops depend on the nature of the parent material; the kind of climate; the relief, or lay of the land; the plant and animal life in and on the soil; and the length of time that these factors have affected development.

In a small area such as these counties, vegetation, time, and climate vary only slightly; therefore, differences in parent material produce more differences between soils than the other factors generally produce. Climate influences the nature and extent of the weathering processes. Relief affects drainage, aeration, runoff, erosion, and exposure to sun and wind. Plants and animals influence soil characteristics through physical and chemical changes. Finally, time is required for the other soil-forming factors to act. Long periods of time are necessary for changes in soils to become apparent. Nevertheless, soils are always slowly changing.

parent material

The parent material of most soils of Bradford and Sullivan Counties is glacial till and outwash sand and gravel. These materials were derived mainly from local red and gray shale, sandstone, and siltstone.

The soils on the uplands, such as Wellsboro, Mardin, Volusia, and Morris soils, formed in the deep glacial till that covers most of the area. The moderately deep Oquaga and Lordstown soils and the shallow Arnot soils are on uplands where the glacial till is thin or where it was eroded away after the glaciers melted.

Soils such as Alton and Wyoming soils formed in outwash sand and gravel that were deposited in the larger stream valleys and as scattered kames, eskers, and terraces on the uplands.

The alluvial deposits along the streams consist of stratified silt, sand, and gravel in which formed some of the youngest soils of the county, such as Pope and Holly soils.

The uplands have many closed depressions and blocked valleys that contain small lakes or shallow ponds. In some of these places bogs developed, and in others woody vegetation gradually encroached on the lakes. In this wet environment plants grew, died, and fell into the water, where they were partially preserved. Medisaprists formed in this organic material.

climate

The climate of this area is the humid-temperate, continental type characteristic of the Middle Atlantic States. Certain features of the soil profiles indicate that this kind of climate has prevailed during soil formation. More information on the climate of Bradford and Sullivan Counties is given in the section "General nature of the area."

The effect of climate on the formation of soils has been nearly uniform throughout the area. Many of the soils are acid and strongly leached. The formation of some soils, however, has been influenced by differences in microclimate caused by differences in relief.

relief

Relief in Bradford and Sullivan Counties is controlled to a large extent by the nature of the geological formations and by the presence of Susquehanna River.

The bedrock is about the same over most of the area. It consists of beds of shale, sandstone, and siltstone that dip gently to the northwest and have an occasional mild anticlinal arch. The bedrock has had only moderate influence on the topography, which was formed by water and glacial action.

Before the advance of the Wisconsin Glacier, the streams had dissected the uplands and formed the valleys to produce a hilly and mountainous landscape. The advancing ice tended to plane off the hills and fill in many of the stream valleys. The melting of the Wisconsin ice left a more subdued, rolling topography.

The glacier deposited till on most of the uplands and outwash in the major valleys, and it formed a few scattered kames, eskers, and terraces. The major streams cut into these unconsolidated deposits, and the uplands now form a gently sloping to moderate steep plateau. In a few places slope exceeds 25 percent, except in areas where the major streams have cut 200

to 400 feet into the plateau and at the southern boundary of Sullivan County.

plant and animal life

Hardwood trees have apparently had more effect on the formation of the soils of Bradford and Sullivan Counties than other kinds of plants have. Hardwood forest originally covered most of the county. The forest was mainly of the oak-hickory type, but sugar maple, beech, and yellow birch occupied smaller areas. Hemlock and pine also grew in small areas that were mostly cooler and wetter and higher than the rest of the county.

The soils are typical of those that developed under forest. Where the soils have not been disturbed, a layer of leaf litter covers a black organic horizon 1 to 3 inches thick. The organic horizon is commonly underlain by a dark-colored surface layer and in some places a light-colored subsurface horizon several inches thick, similar to the one in the profile described as representative of the Morris series.

When the forests were cleared and the soils farmed, the layers of organic matter were incorporated into the plow layer or were burned. Thus, in many places the soils were exposed to wind and rain that produced accelerated erosion. The activities of man, such as cultivation, liming, artificial drainage, manuring, and maintaining perennial plant cover, have had a major effect on the soils.

time

Time is needed to produce soil. The last (Wisconsin) glacial advance and retreat on the uplands of Bradford and Sullivan Counties was some 10,000 to 14,000 years ago. Therefore, the soils in this area are not so old or so well developed as most of those in the southeastern counties of Pennsylvania, which have not been glaciated. Mardin, Volusia, and Chippewa soils are examples of soils in the area that have developed profiles with fairly distinct horizons.

Soils that formed in alluvial material, such as Pope and Holly soils, are young or recent because their parent material has been in place for a shorter time than the parent material of other soils. Alluvial soils generally have less distinct horizons than many of the older soils on uplands. On uplands and terraces, Lordstown, Oquaga, and Wyoming soils have horizons that show some changes, but weathering and profile development of these soils were slowed by the effects of topography and parent material.

processes of soil formation

As weathering proceeds and plants grow on a young soil, several processes take place that form the layers called horizons.

Gains occur as leaves and organic remains fall on the surface. The organic remains are easily seen in undisturbed wooded areas. Organic matter and minerals, including some plant nutrients, are also added by animals, floods, wind, and gravity.

Losses from the soil occur when minerals decompose and some of the products of weathering are leached from the soil by percolating water. Nutrients are lost when crops, forage, or trees are harvested. Fine particles of soil are removed by erosion, and gasses escape when organic matter decays.

Transfers of material from one part of the soil to another are common. Organic matter is moved from the upper part of the profile to the lower part by water. Calcium is also leached from the surface layer, and some is held for a while by the clay in the subsoil. Silt and clay films in the subsoil of Volusia and Morris soils indicate the transfer of silt and clay from the upper part of the profile. Bases and other nutrients are moved when they are absorbed by plant roots and rise in the stems to be stored in leaves and twigs. When the plants die and decay, the nutrients are returned to the surface of the soil.

Transformations in a soil occur as chemical weathering takes place. Iron, aluminum, calcium, and other elements are released from the primary and secondary minerals in the soil and changed into other compounds. In the well drained Lordstown soils, the gray colors of the parent material gradually change to the brown and yellow colors of more weathered and oxidized iron compounds. The brown and yellow colors indicate the release of iron or the oxidation of ferrous oxide to ferric oxide in the presence of an adequate supply of oxygen.

horizon nomenclature

The soil-forming processes interact to develop layers that differ in their properties. These layers, which lie nearly parallel to the surface, are called horizons. The horizons of a soil make up its profile.

The O1 and O2 horizons are accumulations of plant material. They are generally the first to form on the parent material. The O2 horizon is the one in which the maximum amount of organic matter has accumulated. In many places the O horizon has been incorporated into the Ap horizon or has been burned.

The A horizon, or surface layer, is beneath the O2 horizon. Its formation parallels that of the O2 horizon. The A horizon is commonly divided into two layers, the A1 and the A2. The A1 horizon is a dark-colored layer of mixed organic and mineral soil material. The A2 horizon, just beneath the A1 horizon, forms as weathering and leaching, or eluviation, remove the soluble substances from the lower part of the A horizon. If the A horizon has been mixed in plowing and if crop residue and manure have been incorporated, the surface layer is designated "Ap."

The B horizon, or subsoil, is below the A horizon. It generally has more clay and less organic matter than the

A horizon. The B horizon forms after the A horizon has formed. It is often called the illuvial horizon because it has received some of the substances, such as clay, iron, aluminum, oxides, and organic colloids, that have been leached out of the A horizon. The B horizon also contains many secondary minerals, mainly silicate clay, derived from altered primary minerals. The B horizon is a result of both transfer and transformation.

The B horizon has three main subdivisions—B1, B2, and B3. In the B1 horizon, the features of the B horizon are weakly defined. The B2 horizon generally contains the largest amount of clay of any of these parts. A fragipan has formed in the B horizon of certain soils and is designated "Bx." The B3 horizon has some properties of the B horizon and some of the C horizon. In most places it contains less of the altered primary minerals and less accumulated clay than the B2 horizon.

Together, the A and B horizons constitute the solum—the zone in which most of the organic and mineral matter has been added, removed, or transferred through soil-forming processes.

Below the solum is the C horizon, or substratum. The C horizon consists of relatively unweathered parent material or contrasting material, mainly partly weathered minerals and fragments of rock. In some places it contains some of the substances that were leached out of the A and B horizons.

Below the C horizon in some soils is an R horizon of consolidated bedrock, such as shale or sandstone.

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glossary

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 70-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 2.4
Low	2.4 to 3.2
Moderate	3.2 to 5.2
High	More than 5.2

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—
Loose.—Noncoherent when dry or moist; does not hold together in a mass.
Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.
Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.
Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting (in tables). Pits caused by melting ground ice. They form on the soil after plant cover is removed.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05

millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-74 at Towanda, Pa.]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	34.9	16.3	25.6	60	-14	14	1.86	1.07	2.49	5	9.4
February---	37.3	17.1	27.2	60	-13	8	2.19	.98	3.17	5	11.8
March------	45.4	25.2	35.3	74	0	46	2.74	1.69	3.67	6	10.0
April------	60.2	35.3	47.8	86	18	246	3.05	1.88	4.10	7	3.0
May--------	70.5	44.3	57.4	90	26	539	3.43	2.09	4.62	8	.1
June-------	79.5	53.6	66.6	94	37	798	3.08	1.54	4.34	7	.0
July-------	83.5	57.7	70.6	96	43	949	3.03	1.98	3.97	7	.0
August-----	81.5	56.3	68.9	94	39	896	3.19	1.80	4.32	7	.0
September--	74.6	49.9	62.2	92	29	666	3.00	1.62	4.12	6	.0
October----	63.9	39.2	51.5	84	20	362	2.45	1.15	3.51	5	.3
November---	49.7	31.1	40.5	73	11	85	3.08	1.84	4.18	6	4.0
December---	38.4	21.4	29.9	64	-7	29	2.46	1.28	3.42	6	9.8
Yearly----	60.0	37.3	48.6	97	-16	4,638	33.56	29.83	37.17	75	48.4

[1]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by two, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-74 at Towanda, Pa.]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 27	May 16	May 24
2 years in 10 later than--	April 22	May 10	May 21
5 years in 10 later than--	April 13	April 28	May 14
First freezing temperature in fall:			
1 year in 10 earlier than--	October 12	September 28	September 17
2 years in 10 earlier than--	October 18	October 4	September 23
5 years in 10 earlier than--	October 30	October 15	October 4

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-74 at Towanda, Pa.]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	177	142	123
8 years in 10	185	152	130
5 years in 10	199	169	143
2 years in 10	213	187	155
1 year in 10	220	197	162

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Bradford county	Sullivan county	Total-- Area	Total-- Extent
		Acres	Acres	Acres	Pct
AgB	Alton gravelly sandy loam, 0 to 8 percent slopes	7,000	0	7,000	0.7
Ao	Aquepts, rubbly	100	2,500	2,600	0.2
ArC	Arnot very channery loam, rocky, 3 to 15 percent slopes	3,100	2,700	5,800	0.6
AsD	Arnot-Rock outcrop complex, 3 to 25 percent slopes	7,000	9,700	16,700	1.6
BaB	Braceville silt loam, 0 to 8 percent slopes	1,800	230	2,030	0.2
CaA	Canadice silty clay loam, 0 to 3 percent slopes	600	120	720	0.1
CnB	Chenango gravelly loam, 0 to 8 percent slopes	8,300	2,200	10,500	1.0
CpA	Chippewa silt loam, 0 to 3 percent slopes	6,700	2,300	9,000	0.9
CpB	Chippewa silt loam, 3 to 8 percent slopes	9,000	640	9,640	0.9
Du	Dumps, mine	20	220	240	*
DyF	Dystrochrepts, deep-Wellsboro-Oquaga association, steep	84,260	49,200	133,460	12.7
Ho	Holly soils	17,500	2,000	19,500	1.9
Ln	Linden soils	4,100	2,600	6,700	0.6
LoB	Lordstown channery silt loam, 3 to 8 percent slopes	11,700	0	11,700	1.1
LoC	Lordstown channery silt loam, 8 to 15 percent slopes	17,900	0	17,900	1.7
LoD	Lordstown channery silt loam, 15 to 25 percent slopes	19,100	0	19,100	1.8
LpB	Lordstown very stony silt loam, 3 to 8 percent slopes	1,000	0	1,000	0.1
LpD	Lordstown very stony silt loam, 8 to 25 percent slopes	9,900	0	9,900	0.9
MaB	Mardin channery silt loam, 3 to 8 percent slopes	11,600	0	11,600	1.1
MaC	Mardin channery silt loam, 8 to 15 percent slopes	29,800	0	29,800	2.8
MaD	Mardin channery silt loam, 15 to 25 percent slopes	16,200	0	16,200	1.5
MbB	Mardin very stony silt loam, 3 to 8 percent slopes	1,700	0	1,700	0.2
MbD	Mardin very stony silt loam, 8 to 25 percent slopes	2,200	0	2,200	0.2
Md	Medisaprists, ponded	1,200	1,900	3,100	0.3
MoB	Morris channery silt loam, 3 to 8 percent slopes	25,600	8,700	34,300	3.3
MoC	Morris channery silt loam, 8 to 15 percent slopes	30,500	3,600	34,100	3.3
MsB	Morris very stony silt loam, 3 to 8 percent slopes	20,700	29,300	50,000	4.8
MsD	Morris very stony silt loam, 8 to 25 percent slopes	21,100	11,600	32,700	3.1
NoB	Norwich very stony silt loam, 0 to 8 percent slopes	1,900	6,200	8,100	0.8
OcF	Ochrepts-Rock outcrop complex, steep	1,200	18,200	19,400	1.9
OgB	Oquaga channery silt loam, 3 to 8 percent slopes	7,300	4,400	11,700	1.1
OgC	Oquaga channery silt loam, 8 to 15 percent slopes	11,200	6,300	17,500	1.7
OgD	Oquaga channery silt loam, 15 to 25 percent slopes	11,100	3,600	14,700	1.4
OsB	Oquaga extremely stony silt loam, 3 to 8 percent slopes	7,300	22,700	30,000	2.9
OsD	Oquaga extremely stony silt loam, 8 to 25 percent slopes	20,800	29,800	50,600	4.8
Po	Pope soils	10,700	0	10,700	1.0
ReA	Rexford silt loam, 0 to 3 percent slopes	1,800	320	2,120	0.2
ReB	Rexford silt loam, 3 to 8 percent slopes	2,400	250	2,650	0.3
ReC	Rexford silt loam, 8 to 12 percent slopes	1,400	0	1,400	0.1
Uc	Udifluvents, cobbly	14,500	4,500	19,000	1.8
Ud	Udorthents, very channery	300	530	830	0.1
UnB	Unadilla silt loam, 3 to 8 percent slopes	1,600	0	1,600	0.2
UnC	Unadilla silt loam, 8 to 15 percent slopes	1,000	0	1,000	0.1
VoB	Volusia channery silt loam, 3 to 8 percent slopes	78,000	0	78,000	7.5
VoC	Volusia channery silt loam, 8 to 15 percent slopes	113,400	0	113,400	10.7
VoD	Volusia channery silt loam, 15 to 25 percent slopes	20,100	0	20,100	1.9
VsB	Volusia very stony silt loam, 3 to 8 percent slopes	700	0	700	0.1
VsD	Volusia very stony silt loam, 8 to 25 percent slopes	2,100	0	2,100	0.2
WbB	Wellsboro channery silt loam, 3 to 8 percent slopes	9,900	9,800	19,700	1.9
WbC	Wellsboro channery silt loam, 8 to 15 percent slopes	16,600	9,600	26,200	2.5
WbD	Wellsboro channery silt loam, 15 to 25 percent slopes	6,000	2,500	8,500	0.8
WgB	Wellsboro very stony silt loam, 3 to 8 percent slopes	4,500	24,500	29,000	2.8
WgD	Wellsboro very stony silt loam, 8 to 25 percent slopes	11,900	30,800	42,700	4.1
WmB	Wyoming gravelly sandy loam, 3 to 8 percent slopes	1,200	60	1,260	0.1
WmC	Wyoming gravelly sandy loam, 8 to 15 percent slopes	1,800	470	2,270	0.2
WmD	Wyoming gravelly sandy loam, 15 to 25 percent slopes	1,900	280	2,180	0.2
WmF	Wyoming gravelly sandy loam, 25 to 45 percent slopes	1,600	200	1,800	0.2
WoC	Wyoming very stony sandy loam, 3 to 15 percent slopes	200	1,400	1,600	0.2
	Water	5,000	1,400	6,400	0.6
	Total	739,080	307,320	1,046,400	100.0

* Less than 0.1 percent.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Ton	Ton	AUM*
AgB---- Alton	100	20	80	50	4.5	3.5	8.5
Ao**---- Aquepts	---	---	---	---	---	---	---
ArC---- Arnot	60	12	50	25	2.0	1.5	2.5
AsD**---- Arnot-Rock outcrop	---	---	---	---	---	---	---
BaB---- Braceville	105	21	80	60	4.5	3.5	8.5
CaA---- Canadice	75	15	60	---	---	2.5	5.0
CnB---- Chenango	100	20	80	55	4.5	3.5	8.5
CpA, CpB---- Chippewa	---	---	---	---	---	---	---
Du**---- Dumps	---	---	---	---	---	---	---
DyF**:							
Dystrochrepts----	---	---	---	---	---	---	---
Wellsboro----	---	---	---	---	---	---	---
Oquaga----	---	---	---	---	---	---	---
Ho---- Holly	100	20	70	---	---	3.5	8.5
Ln---- Linden	120	24	80	45	4.5	3.5	8.5
LoB---- Lordstown	85	17	75	40	3.5	3.0	6.5
LoC---- Lordstown	85	17	70	40	3.5	3.0	6.5
LoD---- Lordstown	80	16	65	35	3.0	3.0	5.5
LpB, LpD---- Lordstown	---	---	---	---	---	---	---
MaB---- Mardin	90	18	70	40	4.0	3.0	7.5
MaC---- Mardin	85	17	65	40	4.0	3.0	7.5
MaD---- Mardin	80	16	65	35	3.5	3.0	6.5
MbB, MbD---- Mardin	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Ton	Ton	AUM*
Md** Medisaprists	---	---	---	---	---	---	---
MoB Morris	80	16	65	---	3.0	3.0	6.0
MoC Morris	70	14	60	---	3.0	3.0	6.0
MsB, MsD Morris	---	---	---	---	---	---	---
NoB Norwich	---	---	---	---	---	---	---
OcF** Ochrepts-Rock outcrop	---	---	---	---	---	---	---
OgB Oquaga	85	17	75	40	3.5	3.0	6.5
OgC Oquaga	85	17	70	40	3.5	3.0	6.5
OgD Oquaga	80	16	65	35	3.0	3.0	5.5
OsB, OsD Oquaga	---	---	---	---	---	---	---
Po Pope	130	26	80	45	5.0	4.0	8.5
ReA, ReB Rexford	80	16	65	---	3.0	3.0	5.5
ReC Rexford	75	15	60	---	2.5	2.5	5.0
Uc** Udifluvents	---	---	---	---	---	---	---
Ud** Udorthents	---	---	---	---	---	---	---
UnB Unadilla	105	21	75	50	5.0	3.5	6.5
UnC Unadilla	100	20	75	45	4.5	3.5	6.5
VoB Volusia	80	16	65	---	3.0	3.0	5.5
VoC Volusia	70	14	60	---	3.0	3.0	5.5
VoD Volusia	65	13	60	---	2.5	2.5	4.5
VsB, VsD Volusia	---	---	---	---	---	---	---
WbB Wellsboro	90	18	70	4.0	3.0	3.0	8.0
WbC Wellsboro	85	17	65	40	4.0	3.0	8.0

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Ton	Ton	AUM*
WbD---------- Wellsboro	80	16	65	35	3.5	3.0	7.5
WgB, WgD---------- Wellsboro	---	---	---	---	---	---	---
WmB---------- Wyoming	90	18	75	45	4.0	3.0	7.5
WmC---------- Wyoming	75	15	70	40	3.5	2.5	6.5
WmD---------- Wyoming	70	14	50	30	3.0	2.0	5.5
WmF, WoC---------- Wyoming	---	---	---	---	---	---	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Dashes indicate no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I:				
Bradford County	14,800	---	---	---
Sullivan County	2,600	---	---	---
II:				
Bradford County	59,200	28,900	23,300	7,000
Sullivan County	16,630	6,600	10,030	0
III:				
Bradford County	348,300	221,800	125,300	1,200
Sullivan County	30,830	19,500	11,270	60
IV:				
Bradford County	92,500	74,400	16,300	1,800
Sullivan County	9,910	6,380	3,060	470
V:				
Bradford County	---	---	---	---
Sullivan County	---	---	---	---
VI:				
Bradford County	69,600	---	---	69,600
Sullivan County	121,600	---	---	121,600
VII:				
Bradford County	132,360	1,600	---	130,760
Sullivan County	96,500	200	---	96,300
VIII:				
Bradford County	---	---	---	---
Sullivan County	---	---	---	---

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
AgB Alton	3o	Slight	Slight	Slight	Slight	Sugar maple Northern red oak	60 70	Eastern white pine, red pine, Japanese larch.
ArC Arnot	4d	Slight	Slight	Severe	Moderate	Northern red oak Sugar maple Eastern white pine White ash	55 50 55 55	Eastern white pine, red pine.
AsD*: Arnot	4d	Slight	Moderate	Severe	Moderate	Northern red oak Sugar maple Eastern white pine White ash	55 50 55 55	Eastern white pine, red pine.
Rock outcrop.								
BaB Braceville	2o	Slight	Slight	Slight	Slight	Northern red oak White ash Sugar maple Black cherry Yellow-poplar	80 80 80 80 90	Yellow-poplar, Japanese larch, Norway spruce, eastern white pine, black cherry.
CaA Canadice	5w	Slight	Severe	Severe	Moderate	Red maple Eastern white pine	50 55	Eastern white pine, white spruce.
CnB Chenango	2o	Slight	Slight	Slight	Slight	Sugar maple Northern red oak	70 80	Eastern white pine, red pine, Japanese larch.
CpA, CpB Chippewa	5w	Slight	Severe	Severe	Severe	Red maple	50	White spruce, eastern white pine.
DyF*: Dystrochrepts.								
Wellsboro	2x	Moderate	Severe	Slight	Slight	Northern red oak Sugar maple	78 70	Norway spruce, eastern white pine.
Oquaga	3x	Moderate	Severe	Slight	Slight	Sugar maple Northern red oak White ash	73 60 75	Eastern white pine, red pine, Japanese larch, Norway spruce.
Ho* Holly	1w	Slight	Severe	Severe	Moderate	Pin oak Black cherry Red maple	90 --- ---	Red maple, American sycamore, pin oak.
Ln* Linden	1o	Slight	Slight	Slight	Slight	Northern red oak White ash Sugar maple Black cherry Black walnut Eastern white pine Yellow-poplar	90 90 90 90 90 90 100	Yellow-poplar, black walnut, black cherry, red pine, Japanese larch, Norway spruce, eastern white pine.
LoB, LoC Lordstown	3o	Slight	Slight	Slight	Slight	Northern red oak Sugar maple White ash	70 73 75	Eastern white pine, Japanese larch, red pine, Norway spruce.
LoD Lordstown	3r	Slight	Moderate	Slight	Slight	Northern red oak Sugar maple White ash	70 73 75	Eastern white pine, Japanese larch, red pine, Norway spruce.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
LpB---- Lordstown	3o	Slight	Slight	Slight	Slight	Sugar maple---- Northern red oak---- White ash----	70 60 75	Eastern white pine, red pine, Japanese larch, Norway spruce.
LpD---- Lordstown	3r	Slight	Moderate	Slight	Slight	Sugar maple---- Northern red oak---- White ash----	70 60 75	Eastern white pine, red pine, Japanese larch, Norway spruce.
MaB, MaC---- Mardin	3o	Slight	Slight	Slight	Slight	Sugar maple---- Northern red oak---- Black cherry---- White ash----	60 66 70 70	Red pine, Japanese larch, Norway spruce, eastern white pine, white spruce.
MaD---- Mardin	3r	Slight	Moderate	Slight	Slight	Sugar maple---- Northern red oak---- Black cherry---- White ash----	60 66 70 70	Red pine, Japanese larch, Norway spruce, eastern white pine, white spruce.
MbB---- Mardin	3o	Slight	Slight	Slight	Slight	Sugar maple---- Northern red oak---- Black cherry---- White ash----	60 66 70 70	Red pine, Japanese larch, Norway spruce, eastern white pine, white spruce.
MbD---- Mardin	3r	Slight	Moderate	Slight	Slight	Sugar maple---- Northern red oak---- Black cherry---- White ash----	60 66 70 70	Red pine, Japanese larch, Norway spruce, eastern white pine, white spruce.
MoB, MoC---- Morris	3w	Slight	Moderate	Moderate	Moderate	Northern red oak---- Sugar maple---- Black cherry---- White ash----	66 79 69 71	Eastern white pine, Norway spruce, white spruce, Japanese larch.
MsB, MsD---- Morris	3w	Slight	Moderate	Moderate	Moderate	Northern red oak---- Sugar maple---- Black cherry----	66 79 69	Eastern white pine, Norway spruce, white spruce.
NoB---- Norwich	5w	Slight	Severe	Severe	Severe	Red maple----	50	Eastern white pine, white spruce.
OgB, OgC---- Oquaga	3o	Slight	Slight	Slight	Slight	Sugar maple---- Northern red oak---- Black cherry---- Eastern white pine--	69 71 72 75	Eastern white pine, red pine, Japanese larch, Norway spruce, black cherry.
OgD---- Oquaga	3r	Slight	Moderate	Slight	Slight	Sugar maple---- Northern red oak---- Black cherry---- Eastern white pine--	69 71 72 75	Eastern white pine, red pine, Japanese larch, Norway spruce, black cherry.
OsB, OsD---- Oquaga	3x	Slight	Moderate	Slight	Slight	Sugar maple---- Northern red oak---- White ash----	69 71 75	Eastern white pine, red pine, Japanese larch, Norway spruce.
Po*---- Pope	2o	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar---- Eastern white pine-- Virginia pine----	80 102 89 74	Eastern white pine, yellow-poplar, black walnut, black cherry, Norway spruce, Japanese larch.
ReA, ReB, ReC---- Rexford	3w	Slight	Moderate	Moderate	Moderate	Northern red oak---- White ash---- Sugar maple---- Black cherry----	70 70 70 70	Black cherry, Japanese larch, Norway spruce, white spruce, eastern white pine.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
UnB---------- Unadilla	2o	Slight	Slight	Slight	Slight	Sugar maple--------- Eastern white pine-- Northern red oak---- Black cherry-------- White ash----------	70 85 80 80 95	Eastern white pine, Norway spruce, black cherry, Japanese larch, red pine, white spruce.
UnC---------- Unadilla	2r	Moderate	Slight	Slight	Slight	Sugar maple--------- Eastern white pine-- Northern red oak---- Black cherry-------- White ash----------	70 85 80 80 95	Eastern white pine, Norway spruce, black cherry, Japanese larch, red pine, white spruce.
VoB, VoC---------- Volusia	3w	Slight	Moderate	Moderate	Moderate	Northern red oak---- Sugar maple--------- White ash----------	70 64 75	Eastern white pine, Norway spruce, Japanese larch, white spruce, black cherry.
VoD---------- Volusia	3r	Moderate	Moderate	Moderate	Moderate	Northern red oak---- Sugar maple--------- White ash----------	70 64 75	Eastern white pine, Norway spruce, Japanese larch, white spruce, black cherry.
VsB, VsD---------- Volusia	3w	Slight	Moderate	Moderate	Moderate	Northern red oak---- Sugar maple--------- White ash----------	70 64 75	Eastern white pine, Norway spruce, Japanese larch, white spruce, black cherry.
WbB, WbC---------- Wellsboro	2o	Slight	Slight	Slight	Slight	Northern red oak---- Sugar maple---------	78 70	Norway spruce, eastern white pine, red pine, black cherry, Japanese larch.
WbD---------- Wellsboro	2r	Slight	Moderate	Slight	Slight	Northern red oak---- Sugar maple---------	78 70	Norway spruce, eastern white pine, red pine, black cherry, Japanese larch.
WgB---------- Wellsboro	2o	Slight	Slight	Slight	Slight	Northern red oak---- Sugar maple---------	78 70	Norway spruce, eastern white pine, red pine, black cherry.
WgD---------- Wellsboro	2r	Slight	Moderate	Slight	Slight	Northern red oak---- Sugar maple---------	78 70	Norway spruce, eastern white pine, red pine, black cherry.
WmB, WmC---------- Wyoming	4f	Slight	Slight	Severe	Slight	Northern red oak----	55	Eastern white pine, red pine, Virginia pine.
WmD---------- Wyoming	4f	Slight	Moderate	Severe	Slight	Northern red oak----	55	Eastern white pine, red pine, Virginia pine.
WmF---------- Wyoming	4f	Moderate	Severe	Severe	Slight	Northern red oak----	55	Eastern white pine, red pine, Virginia pine.
WoC---------- Wyoming	4f	Slight	Slight	Severe	Slight	Northern red oak----	55	Eastern white pine, red pine, Virginia pine.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AgB Alton	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones.
Ao*. Aquepts					
ArC Arnot	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: slope, small stones.	Slight	Severe: small stones, thin layer.
AsD*: Arnot	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.	Moderate: slope.	Severe: small stones, slope, thin layer.
Rock outcrop.					
BaB Braceville	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
CaA Canadice	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.	Severe: wetness.
CnB Chenango	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: small stones.
CpA, CpB Chippewa	Severe: wetness, percs slowly, excess humus.	Severe: wetness, percs slowly, excess humus.	Severe: wetness, percs slowly, excess humus.	Severe: wetness, excess humus.	Severe: wetness.
Du*. Dumps					
DyF*: Dystrochrepts.					
Wellsboro	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Severe: slope.	Severe: slope.
Oquaga	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: small stones, slope.
Ho* Holly	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
Ln* Linden	Severe: floods.	Slight	Moderate: floods.	Severe: erodes easily.	Moderate: floods.
LoB Lordstown	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: large stones, thin layer.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
LoC---------- Lordstown	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight----------	Moderate: large stones, thin layer, slope.
LoD---------- Lordstown	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
LpB---------- Lordstown	Moderate: large stones.	Moderate: large stones.	Severe: large stones, small stones.	Slight----------	Moderate: large stones, thin layer.
LpD---------- Lordstown	Severe: slope.	Severe: slope.	Severe: slope, large stones, small stones.	Moderate: slope.	Severe: slope.
MaB---------- Mardin	Severe: percs slowly.	Severe: percs slowly.	Severe: small stones, percs slowly.	Moderate: wetness.	Moderate: small stones, wetness.
MaC---------- Mardin	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, small stones, percs slowly.	Moderate: wetness.	Moderate: small stones, slope, wetness.
MaD---------- Mardin	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, small stones, percs slowly.	Moderate: slope, wetness.	Severe: slope.
MbB---------- Mardin	Severe: percs slowly.	Severe: percs slowly.	Severe: large stones, small stones.	Moderate: wetness.	Moderate: large stones, wetness.
MbD---------- Mardin	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: large stones, slope, small stones.	Moderate: slope, wetness.	Severe: slope.
Md*. Medisaprists					
MoB---------- Morris	Severe: wetness.	Severe: wetness.	Severe: small stones, wetness.	Severe: wetness.	Severe: wetness.
MoC---------- Morris	Severe: wetness.	Severe: wetness.	Severe: slope, small stones, wetness.	Severe: wetness.	Severe: wetness.
MsB---------- Morris	Severe: wetness.	Severe: wetness.	Severe: wetness, large stones.	Severe: wetness.	Severe: wetness.
MsD---------- Morris	Severe: slope, wetness.	Severe: wetness, slope.	Severe: wetness, large stones, slope.	Severe: wetness.	Severe: slope, wetness.
NoB---------- Norwich	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: large stones, wetness.	Severe: wetness, excess humus.	Severe: wetness.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
OcF*: Ochrepts. Rock outcrop.					
OgB---- Oquaga	Severe: small stones.	Severe: small stones.	Severe: small stones.	Slight----	Severe: small stones.
OgC---- Oquaga	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Slight----	Severe: small stones.
OgD---- Oquaga	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Moderate: slope.	Severe: small stones, slope.
OsB---- Oquaga	Severe: large stones, small stones.	Severe: large stones, small stones.	Severe: large stones, small stones.	Slight----	Severe: small stones.
OsD---- Oquaga	Severe: slope, large stones, small stones.	Severe: slope, large stones, small stones.	Severe: large stones, slope, small stones.	Moderate: slope.	Severe: small stones, slope.
Po*---- Pope	Severe: floods.	Slight----	Moderate: floods.	Slight----	Moderate: floods.
ReA, ReB---- Rexford	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
ReC---- Rexford	Severe: wetness.	Severe: wetness.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.
Uc*. Udifluvents					
Ud*. Udorthents					
UnB---- Unadilla	Slight----	Slight----	Moderate: slope.	Severe: erodes easily.	Slight.
UnC---- Unadilla	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
VoB---- Volusia	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: small stones, wetness.	Severe: wetness.	Severe: wetness, droughty.
VoC---- Volusia	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: slope, small stones, wetness.	Severe: wetness.	Severe: wetness, droughty.
VoD---- Volusia	Severe: slope, wetness, percs slowly.	Severe: slope, wetness, percs slowly.	Severe: slope, small stones, wetness.	Severe: wetness.	Severe: wetness, droughty, slope.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
VsB---------- Volusia	Severe: wetness, percs slowly.	Severe: wetness.	Severe: large stones, wetness.	Severe: wetness.	Severe: wetness, droughty.
VsD---------- Volusia	Severe: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: large stones, slope, wetness.	Severe: wetness.	Severe: wetness, droughty, slope.
WbB---------- Wellsboro	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Severe: small stones, wetness.	Moderate: wetness.	Moderate: large stones, wetness.
WbC---------- Wellsboro	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, small stones, wetness.	Moderate: wetness.	Moderate: slope, large stones, wetness.
WbD---------- Wellsboro	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, wetness.	Severe: slope.
WgB---------- Wellsboro	Moderate: large stones, percs slowly.	Moderate: large stones, wetness.	Severe: large stones, wetness.	Moderate: wetness.	Moderate: large stones, wetness.
WgD---------- Wellsboro	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Moderate: slope, wetness.	Severe: slope.
WmB---------- Wyoming	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight----------	Severe: small stones, droughty.
WmC---------- Wyoming	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight----------	Severe: small stones, droughty.
WmD---------- Wyoming	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope, small stones, droughty.
WmF---------- Wyoming	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope, small stones, droughty.
WoC---------- Wyoming	Moderate: slope, small stones, large stones.	Moderate: slope, small stones, large stones.	Severe: slope, small stones, large stones.	Slight----------	Moderate: slope, large stones, droughty.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AgB---------- Alton	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Ao*. Aquepts										
ArC---------- Arnot	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
AsD*: Arnot----------	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.
Rock outcrop.										
BaB---------- Braceville	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
CaA---------- Canadice	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
CnB---------- Chenango	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
CpA---------- Chippewa	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
CpB---------- Chippewa	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
Du*. Dumps										
DyF*: Dystrochrepts.										
Wellsboro.										
Oquaga----------	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Ho*---------- Holly	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Ln*---------- Linden	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
LoB---------- Lordstown	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
LoC---------- Lordstown	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
LoD---------- Lordstown	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
LpB---------- Lordstown	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
LpD---------- Lordstown	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
MaB---- Mardin	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
MaC---- Mardin	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
MaD---- Mardin	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
MbB---- Mardin	Very poor.	Poor	Good	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
MbD---- Mardin	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Md*. Medisaprists										
MoB---- Morris	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
MoC---- Morris	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
MsB---- Morris	Very poor.	Poor	Good	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
MsD---- Morris	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
NoB---- Norwich	Very poor.	Poor	Fair	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
OcF*: Ochrepts.										
Rock outcrop.										
OgB---- Oquaga	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
OgC---- Oquaga	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
OgD---- Oquaga	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
OsB---- Oquaga	Very poor.	Very poor.	Good	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
OsD---- Oquaga	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Po*---- Pope	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ReA---- Rexford	Poor	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
ReB---- Rexford	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
ReC---- Rexford	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Uc*. Udifluvents										
Ud*. Udorthents										
UnB---------- Unadilla	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
UnC---------- Unadilla	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
VoB---------- Volusia	Fair	Fair	Fair	Poor	Poor	Poor	Very poor.	Fair	Poor	Very poor.
VoC----------	Fair	Fair	Fair	Poor	Poor	Very	Very	Fair	Poor	Very
VoD---------- Volusia	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
VsB---------- Volusia	Very poor.	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Poor	Very poor.
VsD---------- Volusia	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
WbB---------- Wellsboro	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
WbC---------- Wellsboro	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
WbD---------- Wellsboro	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
WgB---------- Wellsboro	Very poor.	Poor	Good	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
WgD---------- Wellsboro	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
WmB, WmC, WmD------ Wyoming	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
WmF---------- Wyoming	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
WoC---------- Wyoming	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commerical buildings	Local roads and streets	Lawns and landscaping
AgB---------- Alton	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Moderate: small stones.
Ao*. Aquepts						
ArC---------- Arnot	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: small stones, thin layer.
AsD : Arnot----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: small stones, slope, thin layer.
Rock outcrop.						
BaB---------- Braceville	Severe: wetness, cutbanks cave.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Severe: wetness.	Moderate: wetness.
CaA---------- Canadice	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness.	Severe: wetness.
CnB---------- Chenango	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Moderate: small stones.
CpA, CpB---------- Chippewa	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
Du*. Dumps						
DyF*: Dystrochrepts.						
Wellsboro---------	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
Oquaga----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Ho*---------- Holly	Severe: cutbanks cave, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, floods, frost action.	Severe: wetness, floods.
Ln*---------- Linden	Moderate: floods, wetness.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
LoB---------- Lordstown	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock, frost action.	Moderate: large stones, thin layer.
LoC---------- Lordstown	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: slope, depth to rock, frost action.	Moderate: large stones, thin layer, slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
LoD--- Lordstown	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.
LpB--- Lordstown	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Moderate: depth to rock, frost action.	Moderate: large stones, thin layer.
LpD--- Lordstown	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.
MaB--- Mardin	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Moderate: frost action, wetness.	Moderate: small stones, wetness.
MaC--- Mardin	Severe: wetness.	Moderate: slope, wetness.	Severe: wetness.	Severe: slope.	Moderate: slope, frost action, wetness.	Moderate: small stones, slope, wetness.
MaD--- Mardin	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: slope.	Severe: slope.	Severe: slope.
MbB--- Mardin	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: frost action, wetness.	Moderate: large stones, wetness.
MbD--- Mardin	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: slope.	Severe: slope.	Severe: slope.
Md*. Medisaprists						
MoB--- Morris	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, wetness.	Severe: wetness.
MoC--- Morris	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: slope, wetness.	Severe: frost action, wetness.	Severe: wetness.
MsB--- Morris	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, wetness.	Severe: wetness.
MsD--- Morris	Severe: slope, wetness.	Severe: slope, wetness.	Severe: slope, wetness.	Severe: slope, wetness.	Severe: slope, frost action, wetness.	Severe: slope, wetness.
NoB--- Norwich	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
OcF*: Ochrepts. Rock outcrop.						
OgB--- Oquaga	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock, frost action.	Severe: small stones.
OgC--- Oquaga	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: slope, depth to rock.	Severe: small stones.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
OgD---------- Oquaga	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
OsB---------- Oquaga	Severe: depth to rock.	Moderate: depth to rock.	Severe: depth to rock.	Moderate: slope, depth to rock.	Moderate: depth to rock, frost action.	Severe: small stones.
OsD---------- Oquaga	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Po*---------- Pope	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
ReA, ReB---------- Rexford	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
ReC---------- Rexford	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: slope, wetness.	Severe: wetness, frost action.	Severe: wetness.
Uc*. Udifluvents						
Ud*. Udorthents						
UnB---------- Unadilla	Severe: cutbanks cave.	Slight----------	Slight----------	Moderate: slope.	Severe: frost action.	Slight.
UnC---------- Unadilla	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: frost action.	Moderate: slope.
VoB---------- Volusia	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness, droughty.
VoC---------- Volusia	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, slope.	Severe: wetness, frost action.	Severe: wetness, droughty.
VoD---------- Volusia	Severe: wetness, slope.	Severe: wetness, slope.	Severe: wetness, slope.	Severe: wetness, slope.	Severe: wetness, slope, frost action.	Severe: wetness, droughty, slope.
VsB---------- Volusia	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness, droughty.
VsD---------- Volusia	Severe: wetness, slope.	Severe: wetness, slope.	Severe: wetness, slope.	Severe: wetness, slope.	Severe: wetness, slope, frost action.	Severe: wetness, droughty, slope.
WbB---------- Wellsboro	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Severe: frost action.	Moderate: large stones, wetness.
WbC---------- Wellsboro	Severe: wetness.	Moderate: slope, wetness.	Severe: wetness.	Severe: slope.	Severe: frost action.	Moderate: slope, large stones, wetness.
WbD---------- Wellsboro	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: slope.	Severe: slope, frost action.	Severe: slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
WgB---------- Wellsboro	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Severe: frost action.	Moderate: large stones, wetness.
WgD---------- Wellsboro	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
WmB---------- Wyoming	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Severe: small stones, droughty.
WmC---------- Wyoming	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: small stones, droughty.
WmD, WmF---------- Wyoming	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, small stones, droughty.
WoC---------- Wyoming	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope, large stones, droughty.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AgB Alton	Sever: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones, too sandy, seepage.
Ao*. Aquepts					
ArC Arnot	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, small stones.
AsD*: Arnot	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Rock outcrop.					
BaB Braceville	Severe: percs slowly, wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: wetness, seepage.	Poor: seepage, too sandy, small stones.
CaA Canadice	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
CnB Chenango	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
CpA Chippewa	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: small stones, wetness.
CpB Chippewa	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: small stones, wetness.
Du*. Dumps					
DyF*: Dystrochrepts.					
Wellsboro	Severe: slope, wetness, percs slowly.	Severe: slope.	Severe: slope, wetness.	Severe: slope.	Poor: slope, small stones.
Oquaga	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Ho* Holly	Severe: floods, wetness, percs slowly.	Severe: seepage, floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Poor: wetness.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ln* Linden	Severe: floods, wetness, poor filter.	Severe: floods, seepage.	Severe: wetness, floods, seepage.	Severe: seepage, floods.	Fair: thin layer.
LoB Lordstown	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
LoC Lordstown	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
LoD Lordstown	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Poor: area reclaim, slope, thin layer.
LpB Lordstown	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
LpD Lordstown	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Poor: area reclaim, slope, thin layer.
MaB Mardin	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Moderate: wetness.	Poor: small stones.
MaC Mardin	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Moderate: slope, wetness.	Poor: small stones.
MaD Mardin	Severe: slope, percs slowly, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: slope.	Poor: slope, small stones.
MbB Mardin	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Moderate: wetness.	Poor: small stones.
MbD Mardin	Severe: slope, percs slowly, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: slope.	Poor: small stones, slope.
Md*. Medisaprists					
MoB Morris	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness, small stones.
MoC Morris	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness, small stones.
MsB Morris	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
MsD Morris	Severe: slope, percs slowly, wetness.	Severe: slope.	Severe: wetness, slope.	Severe: slope, wetness.	Poor: slope, wetness.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
NoB Norwich	Severe: wetness, percs slowly.	Moderate: slope, large stones.	Severe: wetness.	Severe: wetness.	Poor: small stones, wetness.
OcF*: Ochrepts.					
Rock outcrop.					
OgB Oquaga	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, small stones.
OgC Oquaga	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, small stones.
OgD Oquaga	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
OsB Oquaga	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, small stones.
OsD Oquaga	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Po* Pope	Severe: floods.	Severe: seepage, floods.	Severe: floods, seepage.	Severe: floods, seepage.	Poor: small stones.
ReA, ReB Rexford	Severe: percs slowly, wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
ReC Rexford	Severe: percs slowly, wetness, poor filter.	Severe: slope, seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
Uc*. Udifluvents					
Ud*. Udorthents					
UnB Unadilla	Slight	Severe: seepage.	Severe: seepage.	Slight	Fair: thin layer.
UnC Unadilla	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Moderate: slope.	Fair: slope, thin layer.
VoB Volusia	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
VoC Volusia	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
VoD---------- Volusia	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: wetness, slope.	Severe: wetness, slope.	Poor: slope, wetness.
VsB---------- Volusia	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
VsD---------- Volusia	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: wetness, slope.	Severe: wetness, slope.	Poor: slope, wetness.
WbB---------- Wellsboro	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Moderate: wetness.	Poor: small stones.
WbC---------- Wellsboro	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Moderate: slope, wetness.	Poor: small stones.
WbD---------- Wellsboro	Severe: slope, percs slowly, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: slope.	Poor: slope, small stones.
WgB---------- Wellsboro	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Moderate: wetness.	Poor: small stones.
WgD---------- Wellsboro	Severe: slope, wetness, percs slowly.	Severe: slope.	Severe: slope, wetness.	Severe: slope.	Poor: slope, small stones.
WmB---------- Wyoming	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
WmC---------- Wyoming	Severe: poor filter.	Severe: slope, seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
WmD, WmF---------- Wyoming	Severe: slope, poor filter.	Severe: slope, seepage.	Severe: slope, seepage, too sandy.	Severe: slope, seepage.	Poor: slope, seepage, too sandy.
WoC---------- Wyoming	Severe: poor filter.	Severe: slope, seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AgB Alton	Good	Probable	Probable	Poor: small stones, area reclaim.
Ao*. Aquepts				
ArC Arnot	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
AsD*: Arnot	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
BaB Braceville	Poor: wetness.	Probable	Probable	Poor: small stones, area reclaim.
CaA Canadice	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, too clayey, thin layer.
CnB Chenango	Good	Probable	Probable	Poor: small stones, area reclaim.
CpA, CpB Chippewa	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, area reclaim, small stones.
Du*. Dumps				
DyF*: Dystrochrepts.				
Wellsboro	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones, area reclaim.
Oquaga	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Ho* Holly	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ln* Linden	Good	Probable	Probable	Fair: thin layer.
LoB, LoC Lordstown	Poor: thin layer, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
LoD---------- Lordstown	Poor: thin layer, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
LpB---------- Lordstown	Poor: thin layer, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
LpD---------- Lordstown	Poor: thin layer, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
MaB, MaC---------- Mardin	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
MaD---------- Mardin	Fair: slope, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
MbB---------- Mardin	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
MbD---------- Mardin	Fair: slope, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, area reclaim, small stones.
Md*. Medisaprists				
MoB, MoC, MsB--------- Morris	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
MsD---------- Morris	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, wetness.
NoB---------- Norwich	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, wetness.
OcF*: Ochrepts.				
Rock outcrop.				
OgB, OgC---------- Oquaga	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
OgD---------- Oquaga	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
OsB---------- Oquaga	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
OsD---------- Oquaga	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Po*---------- Pope	Good----------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
ReA, ReB, ReC--------- Rexford	Poor: wetness, thin layer.	Probable----------	Probable----------	Poor: wetness, small stones, area reclaim.
Uc*. Udifluvents				
Ud*. Udorthents				
UnB, UnC---------- Unadilla	Good----------	Probable----------	Probable----------	Moderate: area reclaim.
VoB, VoC, VoD--------- Volusia	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, wetness.
VsB, VsD---------- Volusia	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, wetness.
WbB, WbC---------- Wellsboro	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
WbD---------- Wellsboro	Fair: wetness, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones, area reclaim.
WgB---------- Wellsboro	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
WgD---------- Wellsboro	Fair: wetness, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones, area reclaim.
WmB, WmC---------- Wyoming	Good----------	Probable----------	Probable----------	Poor: small stones, area reclaim.
WmD---------- Wyoming	Fair: slope.	Probable----------	Probable----------	Poor: slope, small stones, area reclaim.
WmF---------- Wyoming	Poor: slope.	Probable----------	Probable----------	Poor: slope, small stones, area reclaim.
WoC---------- Wyoming	Good----------	Probable----------	Probable----------	Poor: small stones, area reclaim.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
AgB---------- Alton	Severe: seepage.	Moderate: thin layer, seepage, piping.	Severe: no water.	Deep to water	Large stones---	Large stones, droughty.
Ao*. Aquepts						
ArC---------- Arnot	Severe: depth to rock, slope.	Severe: seepage, thin layer.	Severe: no water.	Deep to water	Large stones, slope, depth to rock.	Large stones, slope, depth to rock.
AsD*: Arnot----------	Severe: depth to rock, slope.	Severe: seepage, thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, droughty.	Large stones, slope, depth to rock.
Rock outcrop.						
BaB---------- Braceville	Severe: seepage.	Severe: seepage, wetness.	Severe: no water.	Slope, percs slowly.	Wetness, rooting depth, percs slowly.	Percs slowly, wetness, droughty.
CaA---------- Canadice	Slight---------	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly---	Erodes easily, wetness, percs slowly.	Wetness, percs slowly, erodes easily.
CnB---------- Chenango	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Too sandy------	Droughty.
CpA---------- Chippewa	Slight---------	Severe: piping, wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, rooting depth, percs slowly.	Wetness, rooting depth, percs slowly.
CpB---------- Chippewa	Moderate: slope.	Severe: piping, wetness.	Severe: slow refill.	Percs slowly, frost action, slope.	Wetness, rooting depth, percs slowly.	Wetness, rooting depth, percs slowly.
Du*. Dumps						
DyF*: Dystrochrepts.						
Wellsboro--------	Severe: slope.	Severe: piping.	Severe: no water.	Percs slowly, frost action, slope.	Slope, large stones, wetness.	Large stones, rooting depth, slope.
Oquaga----------	Severe: slope.	Severe: seepage, piping, thin layer.	Severe: no water.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Ho*---------- Holly	Severe: seepage.	Severe: piping, wetness, seepage.	Severe: slow refill, cutbanks cave.	Floods, frost action, cutbanks cave.	Wetness, too sandy.	Wetness.
Ln*---------- Linden	Severe: seepage.	Severe: piping.	Moderate: deep to water.	Deep to water	Erodes easily	Erodes easily.
LoB---------- Lordstown	Moderate: seepage, depth to rock, slope.	Severe: piping, thin layer.	Severe: no water.	Deep to water	Depth to rock	Depth to rock.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
LoC, LoD---------- Lordstown	Severe: slope.	Severe: piping, thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
LpB---------- Lordstown	Moderate: seepage, depth to rock, slope.	Severe: piping, thin layer.	Severe: no water.	Deep to water	Large stones, depth to rock.	Large stones, depth to rock.
LpD---------- Lordstown	Severe: slope.	Severe: piping, thin layer.	Severe: no water.	Deep to water	Slope, large stones, depth to rock.	Slope, large stones, depth to rock.
MaB---------- Mardin	Moderate: slope.	Moderate: piping, wetness.	Severe: no water.	Slope, percs slowly.	Wetness, rooting depth, percs slowly.	Wetness, rooting depth, percs slowly.
MaC, MaD---------- Mardin	Severe: slope.	Moderate: piping, wetness.	Severe: no water.	Slope, percs slowly.	Slope, wetness, rooting depth.	Slope, wetness, rooting depth.
MbB---------- Mardin	Moderate: slope.	Moderate: piping, wetness.	Severe: no water.	Slope, percs slowly.	Large stones, wetness, rooting depth.	Large stones, rooting depth.
MbD---------- Mardin	Severe: slope.	Moderate: piping, wetness.	Severe: no water.	Slope, percs slowly.	Slope, large stones, wetness.	Slope, large stones, rooting depth.
Md*. Medisaprists						
MoB---------- Morris	Moderate: slope.	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Percs slowly, wetness, rooting depth.	Wetness, rooting depth, percs slowly.
MoC---------- Morris	Severe: slope.	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Percs slowly, wetness, slope.	Wetness, rooting depth, slope.
MsB---------- Morris	Moderate: slope.	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Percs slowly, wetness, large stones.	Percs slowly, wetness, large stones.
MsD---------- Morris	Severe: slope.	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, large stones.	Slope, wetness, large stones.
NoB---------- Norwich	Moderate: slope.	Severe: piping, wetness.	Severe: slow refill.	Percs slowly, frost action, slope.	Large stones, wetness, rooting depth.	Large stones, wetness, rooting depth.
OcF*: Ochrepts. Rock outcrop.						
OgB---------- Oquaga	Moderate: seepage, depth to rock, slope.	Severe: seepage, piping, thin layer.	Severe: no water.	Deep to water	Large stones, depth to rock.	Large stones, droughty.
OgC, OgD---------- Oquaga	Severe: slope.	Severe: seepage, piping, thin layer.	Severe: no water.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, droughty.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
OsB---------- Oquaga	Moderate: seepage, depth to rock, slope.	Severe: seepage, piping, thin layer.	Severe: no water.	Depth to water	Large stones, depth to rock.	Large stones, droughty
OsD---------- Oquaga	Severe: slope.	Severe: seepage, piping, thin layer.	Severe: no water.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Po*---------- Pope	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Favorable------	Droughty.
ReA---------- Rexford	Moderate: seepage.	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly, rooting depth.	Percs slowly, wetness, rooting depth.
ReB---------- Rexford	Moderate: seepage, slope.	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, percs slowly, rooting depth.	Percs slowly, wetness, rooting depth.
ReC---------- Rexford	Severe: slope.	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, percs slowly, wetness.
Uc*. Udifluvents						
Ud*. Udorthents						
UnB---------- Unadilla	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
UnC---------- Unadilla	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
VoB---------- Volusia	Moderate: slope.	Severe: wetness.	Severe: no water.	Percs slowly, frost action, slope.	Large stones, wetness, rooting depth.	Large stones, wetness.
VoC, VoD---------- Volusia	Severe: slope.	Severe: wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, large stones, wetness.	Large stones, wetness, slope.
VsB---------- Volusia	Moderate: slope.	Severe: wetness.	Severe: no water.	Percs slowly, frost action, slope.	Large stones, wetness, rooting depth.	Large stones, wetness.
VsD---------- Volusia	Severe: slope.	Severe: wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, large stones, wetness.	Large stones, wetness, slope.
WbB---------- Wellsboro	Moderate: slope.	Severe: piping.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, rooting depth, percs slowly.	Rooting depth, percs slowly.
WbC, WbD---------- Wellsboro	Severe: slope.	Severe: piping.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, rooting depth, slope.	Rooting depth, percs slowly, slope.
WgB---------- Wellsboro	Moderate: slope.	Severe: piping.	Severe: no water.	Percs slowly, frost action, slope.	Large stones, rooting depth, wetness.	Large stones, rooting depth, wetness.
WgD---------- Wellsboro	Severe: slope.	Severe: piping.	Severe: no water.	Percs slowly, frost action, slope.	Slope, large stones, wetness.	Large stones, rooting depth, slope.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
WmB---------- Wyoming	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Large stones, too sandy.	Large stones, droughty.
WmC, WmD, WmF----- Wyoming	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Large stones, too sandy, slope.	Large stones, droughty, slope.
Woc---------- Wyoming	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Depth to water	Large stones, too sandy, slope.	Large stones, droughty,

*See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AgB---------- Alton	0-8	Gravelly sandy loam.	SM, ML, GM, GP-GM	A-2, A-4, A-1	0-5	65-75	60-70	30-65	10-60	<10	NP-3
	8-36	Gravelly loam, very gravelly sandy loam.	GM, SM	A-2, A-4, A-1	5-25	45-70	35-55	20-50	20-40	<10	NP-3
	36-60	Very gravelly sand, very gravelly loamy sand.	GP, GM, SM, SP-SM	A-1	10-25	45-60	40-50	20-40	2-15	---	NP
Ao*. Aquepts											
ArC---------- Arnot	0-5	Very channery loam.	GM, SM	A-2, A-4, A-1, A-5	10-25	30-60	25-55	20-55	15-50	35-45	1-9
	5-15	Very channery silt loam, very channery loam.	GM, GM-GC, SM, SM-SC	A-2, A-4, A-1	10-25	30-60	25-55	20-55	15-50	20-35	1-9
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
AsD*: Arnot----------	0-2	Very channery loam.	GM, SM	A-2, A-4, A-1, A-5	10-25	30-60	25-55	20-55	15-50	35-45	1-9
	2-15	Very channery silt loam, very channery loam.	GM, GM-GC, SM, SM-SC	A-2, A-4, A-1	10-25	30-60	25-55	20-55	15-50	20-35	1-9
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
BaB---------- Braceville	0-8	Silt loam--------	ML, CL, SM	A-4, A-2	0-15	95-100	80-100	75-100	30-90	---	---
	8-22	Gravelly sandy loam, silt loam, gravelly loam.	ML, SM, GM-GC, CL-ML	A-2, A-4, A-1	0-10	65-100	60-100	40-100	20-90	15-35	NP-10
	22-37	Gravelly sandy loam, gravelly silt loam.	ML, SM, GM-GC, CL-ML	A-2, A-4, A-1	0-10	65-100	40-75	25-75	15-65	15-35	NP-10
	37-60	Stratified sand and gravel.	GM, SM, GW-GM, GP-GM	A-1, A-2, A-4	0-15	40-100	35-100	25-90	10-50	<30	NP-5
CaA---------- Canadice	0-9	Silty clay loam	ML, MH	A-7	0	100	95-100	85-100	65-95	40-65	10-25
	9-45	Silty clay, clay, silty clay loam.	CL, CH, MH, ML	A-7	0	100	95-100	85-100	70-95	45-65	20-30
	45-60	Silty clay, clay, silty clay loam.	CL, CH, MH, ML	A-7	0	100	95-100	85-100	70-95	45-65	20-30
CnB---------- Chenango	0-9	Gravelly loam----	ML, SM, GM	A-2, A-4, A-1	5-15	55-85	55-80	35-80	15-70	<35	NP-10
	9-30	Gravelly silt loam, gravelly fine sandy loam, very gravelly silt loam.	ML, GM, SM	A-2, A-4, A-1	5-10	35-80	30-75	25-75	15-65	<40	NP-10
	30-60	Very gravelly loamy coarse sand, very gravelly sand, gravelly loamy fine sand.	GW, GM, SM, SP	A-1	5-10	25-65	20-60	10-50	1-20	---	NP

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
CpA, CpB--------- Chippewa	0-7	Silt loam---------	ML, OL	A-7, A-5	0-5	80-100	75-100	65-95	55-85	40-50	5-15
	7-18	Channery silt loam, loam, channery silty clay loam.	GM, ML, SM-SC, CL-ML	A-4	0-10	65-95	60-95	45-85	35-75	25-35	5-10
	18-51	Very channery silt loam, channery loam, channery silty clay loam.	CL, GC, SC, CL-ML	A-2, A-4	10-15	60-80	55-70	45-70	30-65	15-25	5-10
	51-60	Very channery silt loam, channery loam, channery silty clay loam.	GM, ML, CL-ML, SM	A-2, A-4	10-15	60-80	55-70	45-70	30-65	25-35	5-10
Du*. Dumps											
DyF*: Dystrochrepts.											
Wellsboro--------	0-8	Extremely stony silt loam.	ML, CL, SM	A-4, A-2	5-25	70-100	65-100	60-95	30-90	---	---
	8-20	Loam, channery silt loam, gravelly loam.	ML, SM, CL-ML, GM-GC	A-2, A-4	0-15	70-100	60-100	55-95	30-70	15-30	NP-10
	20-60	Loam, channery silt loam, channery loam.	GM, ML, CL, SM	A-2, A-4	0-20	55-90	45-90	35-80	25-60	15-30	NP-10
Oquaga----------	0-7	Extremely stony silt loam.	GM, ML, SM	A-4, A-2, A-5	10-25	50-85	40-80	35-70	25-65	35-45	2-7
	7-32	Very channery silt loam, very channery loam.	GM, ML, SM, GM-GC	A-1, A-2, A-4	10-25	35-70	25-60	20-60	15-55	20-30	2-7
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Ho*-------------- Holly	0-8	Silt loam--------	ML	A-4	0	90-100	85-100	80-100	70-90	25-35	3-10
	8-37	Silt loam, loam, sandy loam.	ML, SM	A-4, A-6	0	85-100	75-100	70-95	45-85	20-40	NP-14
	37-60	Stratified silt loam to gravelly sand.	ML, SM, SP-SM	A-4, A-2, A-1	0-5	70-100	65-100	40-90	10-70	20-40	NP-10
Ln*-------------- Linden	0-9	Silt loam--------	ML, SM	A-4	0	80-100	80-100	65-100	40-90	---	---
	9-45	Silt loam, gravelly loam, sandy loam.	ML, SM	A-4, A-2	0-5	80-100	65-100	40-95	25-90	<30	NL -3
	45-60	Loam, gravelly sandy loam, very gravelly sand.	SM, GM, ML, SP-SM	A-2, A-1, A-3, A-4	0-20	40-100	30-100	15-90	5-75	<25	NP-5
LoB, LoC, LoD----- Lordstown	0-7	Channery silt loam.	ML, GM, SM	A-4	5-20	65-85	50-75	50-75	40-65	<30	NP-4
	7-31	Channery silt loam, channery loam.	ML, GM, SM	A-4	5-10	65-85	50-75	50-75	40-65	<30	NP-4
	31-34	Very channery loam, channery silt loam, very channery fine sandy loam.	ML, GM, SM	A-2, A-4, A-1	5-25	40-75	30-70	25-70	15-60	<30	NP-4
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
LpB, LpD---------- Lordstown	0-7	Very stony silt loam.	ML, GM, SM	A-4	10-20	65-85	50-75	50-75	40-65	<30	NP-4
	7-31	Channery silt loam, channery loam.	ML, GM, SM	A-4	5-10	65-85	50-75	50-75	40-65	<30	NP-4
	31-34	Very channery loam, channery silt loam, very channery fine sandy loam.	ML, GM, SM	A-2, A-4, A-1	5-25	40-75	30-70	25-70	15-60	<30	NP-4
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
MaB, MaC, MaD---- Mardin	0-8	Channery silt loam.	GM, ML, CL, GC	A-4	5-20	65-75	60-70	50-70	35-60	25-35	5-10
	8-20	Channery silt loam, loam, gravelly loam.	CL, GC, CL-ML, SM-SC	A-4	5-10	60-90	55-90	45-90	35-80	15-25	5-10
	20-57	Channery loam, channery silt loam, very channery loam.	CL, GC, SC, CL-ML	A-2, A-4, A-1	10-25	40-80	35-75	30-70	20-65	20-30	5-10
	57-60	Channery loam, channery silt loam, very channery silt loam.	CL, GC, SC, CL-ML	A-2, A-4, A-1	10-25	40-80	35-75	30-70	20-65	20-30	5-10
MbB, MbD---------- Mardin	0-8	Very stony silt loam.	GM, ML, CL, GC	A-4	5-10	65-75	60-70	50-70	35-60	25-35	5-10
	8-20	Channery silt loam, loam, gravelly loam.	CL, GC, SC, CL-ML	A-4	5-10	60-90	55-90	45-90	35-80	15-25	5-10
	20-60	Channery loam, channery silt loam, very channery silt loam.	CL, GC, SC, CL-ML	A-2, A-4, A-1	10-25	40-80	35-75	30-70	20-65	20-30	5-10
Md*. Medisaprists											
MoB, MoC---------- Morris	0-16	Channery silt loam.	GM, ML, CL, SM	A-4, A-2	0-15	60-95	55-85	40-85	30-70	20-30	1-10
	16-60	Channery silt loam, channery loam, channery silty clay loam.	GM, SM, CL, ML	A-2, A-4	0-20	60-95	45-80	40-80	25-75	15-25	NP-9
MsB, MsD---------- Morris	0-16	Very stony silt loam.	GM, ML, CL, SM	A-4, A-2	3-20	60-95	55-85	40-80	30-70	20-30	1-10
	16-60	Channery loam, channery silt loam, channery silty clay loam.	GM, ML, CL, SM	A-2, A-4	0-20	60-95	45-80	40-80	25-75	15-25	NP-9
NoB---------- Norwich	0-4	Very stony silt loam.	GM, ML, OL, SM	A-7 , A-5	10-20	70-90	65-85	60-80	40-75	40-50	5-15
	4-20	Channery silt loam, channery loam, loam.	GM, ML, SM, CL-ML	A-4	0-15	65-95	65-90	60-85	40-80	25-35	5-10
	20-60	Channery silt loam, channery loam, very channery sandy loam.	CL-ML, SM-SC, GC, SC	A-2, A-4	10-25	60-90	55-70	35-70	20-65	15-25	5-10

See footnote at end of table.

TABLE 14.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
OcF*: Ochrepts.											
Rock outcrop.											
OgB, OgC, OgD---- Oquaga	0-7	Channery silt loam.	ML, GM, SM	A-4, A-2, A-5	5-20	50-85	40-80	35-70	25-65	35-45	2-7
	7-32	Very channery loam, very channery silt loam.	GM, ML, SM, GM-GC	A-1, A-2, A-4	10-25	35-70	25-60	20-60	15-55	20-30	2-7
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
OsB, OsD---------- Oquaga	0-7	Extremely stony silt loam.	GM, ML, SM	A-4, A-2, A-5	10-25	50-85	40-80	35-70	25-65	35-45	2-7
	7-32	Very channery silt loam, very channery loam.	GM, ML, SM, GM-GC	A-1, A-2, A-4	10-25	35-70	25-60	20-60	15-55	20-30	2-7
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Po*---------- Pope	0-10	Silt loam--------	ML, CL, SM, CL-ML	A-4	0-5	75-100	65-100	55-95	40-90	<30	NP-10
	10-40	Fine sandy loam, sandy loam, gravelly loam.	SM, SM-SC, ML, GM	A-2, A-1, A-4	0-5	55-100	50-100	35-95	15-70	<30	NP-7
	40-60	Fine sandy loam, loamy sand, gravelly fine sandy loam.	SM, SM-SC, ML, GM	A-2, A-1, A-4	0-20	45-100	35-100	30-95	15-70	<30	NP-7
ReA, ReB, ReC---- Rexford	0-18	Silt loam--------	ML, CL, SM, SC	A-4, A-2	0-5	95-100	80-100	75-95	30-90	15-35	NP-10
	18-42	Gravelly sandy loam, loam, silt loam.	ML, SM, GM	A-2, A-4	0-10	60-100	50-100	40-85	25-70	20-35	NP-5
	42-60	Stratified sand and gravel to gravelly sandy loam.	GP-GM, SP-SM, GW, SP	A-1, A-2	0-20	40-55	30-50	10-40	4-35	<10	NP
Uc*. Udifluvents											
Ud*. Udorthents											
UnB---------- Unadilla	0-10	Silt loam--------	ML	A-4	0	100	95-100	90-100	70-90	<35	NP-10
	10-55	Silt loam, very fine sandy loam.	ML, CL-ML	A-4	0	100	95-100	90-100	70-90	<25	NP-10
	55-60	Very gravelly sand, gravelly loam, loamy sand.	GM, GP, SM, SP	A-2, A-1, A-3	0-10	35-100	25-95	10-70	1-30	---	NP
UnC---------- Unadilla	0-10	Silt loam--------	ML	A-4	0	100	95-100	90-100	70-90	<35	NP-10
	10-55	Silt loam, very fine sandy loam.	ML, CL-ML	A-4	0	100	95-100	90-100	70-90	<25	NP-10
	55-60	Very gravelly sand, gravelly loam, loamy sand.	GM, GP, SM, SP	A-2, A-1, A-3	0-10	35-100	25-95	10-70	1-30	---	NP

See footnote at end of table.

TABLE 14.--ENGINEERINC INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
VoB, VoC, VoD---- Volusia	0-8	Channery silt loam.	GM, ML, SM	A-4, A-5	5-10	70-85	65-80	55-80	40-70	35-45	5-10
	8-14	Channery silt loam, channery loam, silt loam.	CL-ML, CL, GM-GC, SC	A-4	5-10	65-90	60-85	50-85	35-75	15-25	5-10
	14-50	Channery silt loam, channery loam, silty clay loam.	SM-SC, CL, SC, CL-ML	A-4	10-25	75-90	70-85	60-85	40-80	20-30	5-10
	50-60	Very channery loam, channery loam, silt loam.	GM-GC, SC, CL, CL-ML	A-2, A-4, A-1	10-25	40-90	35-85	30-85	20-75	20-30	5-10
VsB, VsD--------- Volusia	0-8	Very stony silt loam.	GM, ML, SM	A-4, A-5	5-15	70-85	65-80	55-80	40-70	35-45	5-10
	8-14	Channery silt loam, channery loam, silt loam.	CL-ML, CL, GM-GC, SC	A-4	5-10	65-90	60-85	50-85	35-75	15-25	5-10
	14-50	Channery silt loam, channery loam, silty clay loam.	SM-SC, CL-ML, CL, SC	A-4	10-25	75-90	70-85	60-85	40-80	20-30	5-10
	50-60	Very channery loam, channery loam, silt loam.	GM-GC, CL-ML, CL, SC	A-4, A-2, A-1	10-25	40-90	35-85	30-85	20-75	20-30	5-10
WbB, WbC, WbD---- Wellsboro	0-8	Channery silt loam.	ML, CL, SM	A-2, A-4	0-15	70-90	65-85	60-80	30-60	---	---
	8-20	Loam, channery silt loam, gravelly loam.	ML, SM, CL-ML, GM-GC	A-2, A-4	0-15	70-100	60-100	55-95	30-70	15-30	NP-10
	20-60	Loam, channery sandy loam, gravelly silt loam.	SM, GM, ML, CL	A-2, A-4	0-20	55-90	45-90	35-80	25-60	15-30	NP-10
WgB, WgD--------- Wellsboro	0-8	Very stony silt loam.	ML, CL, SM	A-4, A-2	5-15	70-100	65-100	60-95	30-90	---	---
	8-20	Loam, channery silt loam, gravelly loam.	ML, SM, CL-ML, GM-GC	A-2, A-4	0-15	70-100	60-100	55-95	30-70	15-30	NP-10
	20-60	Loam, channery silt loam, channery loam.	GM, ML, CL, SM	A-2, A-4	0-20	55-90	45-90	35-80	25-60	15-30	NP-10
WmB, WmC, WmD, WmF---------- Wyoming	0-9	Gravelly sandy loam.	SM, SW-SM, GM, SP-SM	A-1, A-2, A-3	0-15	40-90	30-80	10-60	8-35	<30	NP-5
	9-26	Gravelly sandy loam, very gravelly sandy loam.	SM, GM, GP-GM, SP-SM	A-1, A-2, A-3	0-25	40-75	35-70	5-55	5-35	<30	NP-5
	26-60	Very gravelly loamy sand, very gravelly sand, gravelly sandy loam.	GW, SM, SW, GP-GM	A-1	5-30	30-65	20-55	5-50	1-12	<25	NP-5
WoC---------- Wyoming	0-9	Very stony sandy loam.	SM, SW-SM, GM, SP-SM	A-1, A-2, A-3	10-25	40-90	30-80	10-60	8-35	<30	NP-5
	9-26	Gravelly sandy loam, very gravelly sandy loam.	SM, GM, GP-GM, SP-SM	A-1, A-2, A-3	0-25	40-75	35-70	5-55	5-35	<30	NP-5
	26-60	Very gravelly loamy sand, very gravelly sand, gravelly sandy loam.	GW, SM, SW, GP-GM	A-1	5-30	30-65	20-55	5-50	1-12	<25	NP-5

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm3	In/hr	In/in	pH				Pct
AgB----------	0-8	1-12	1.35-1.65	2.0-6.0	0.06-0.14	5.1-5.5	Low----------	0.17	3	2-5
Alton	8-36	1-12	1.45-1.65	2.0-6.0	0.07-0.09	5.1-7.3	Low----------	0.17		
	36-60	1-4	1.45-1.65	6.0	0.02-0.04	5.6-7.8	Low----------	0.17		
Ao*.										
Aquepts										
ArC----------	0-5	8-18	1.10-1.40	0.6-2.0	0.08-0.12	3.6-6.0	Low----------	0.17	2	3-6
Arnot	5-15	8-18	1.20-1.50	0.6-2.0	0.08-0.12	3.6-6.0	Low----------	0.17		
	15	---	---	---	---	---	----------	----		
AsD*:										
Arnot----------	0-2	8-18	1.10-1.40	0.6-2.0	0.08-0.12	3.6-6.0	Low----------	0.17	2	3-6
	2-15	8-18	1.20-1.50	0.6-2.0	0.08-0.12	3.6-6.0	Low----------	0.17		
	15	---	---	---	---	---	----------	----		
Rock outcrop.										
BaB----------	0-8	10-25	1.20-1.40	0.2-2.0	0.08-0.16	4.5-6.0	Low----------	0.24	3	1-3
Braceville	8-22	10-25	1.20-1.50	0.2-2.0	0.08-0.12	4.5-6.0	Low----------	0.24		
	22-37	10-25	1.30-1.60	0.06-0.6	0.06-0.10	5.1-6.5	Low----------	0.24		
	37-60	5-25	1.20-1.40	2.0-20	0.03-0.06	5.1-6.5	Low----------	0.20		
CaA----------	0-9	20-40	1.35-1.55	0.2-2.0	0.17-0.21	4.5-6.5	Moderate-----	0.49	5	3-11
Canadice	9-45	35-60	1.40-1.75	<0.06	0.12-0.17	5.1-7.8	Moderate-----	0.28		
	45-60	35-60	1.40-1.50	<0.06	0.13-0.17	6.6-8.4	Moderate-----	0.28		
CnB----------	0-9	6-18	1.20-1.50	0.6-6.0	0.08-0.15	4.5-5.5	Low----------	0.24	3	2-6
Chenango	9-30	6-18	1.25-1.55	0.6-6.0	0.05-0.14	4.5-6.0	Low----------	0.17		
	30-60	1-8	1.45-1.65	6.0-20.0	0.01-0.03	5.1-6.6	Low----------	0.17		
CpA, CpB----------	0-7	10-27	1.10-1.40	0.6-2.0	0.14-0.21	4.5-6.5	Low----------	0.32	3	3-10
Chippewa	7-18	18-35	1.20-1.50	0.6-2.0	0.10-0.17	4.5-6.5	Low----------	0.32		
	18-51	10-35	1.70-2.00	<0.2	0.01-0.02	5.1-7.3	Low----------	0.24		
	51-60	10-35	1.65-1.95	<0.2	0.01-0.02	5.6-8.4	Low----------	0.24		
Du*.										
Dumps										
DyF*:										
Dystrochrepts.										
Wellsboro--------	0-8	15-25	1.20-1.40	0.6-2.0	0.10-0.14	4.5-6.0	Low----------	0.15	3	---
	8-20	15-27	1.30-1.50	0.6-2.0	0.10-0.14	4.5-6.0	Low----------	0.28		
	20-60	15-27	1.30-1.60	0.06-0.2	0.06-0.10	4.5-6.0	Low----------	0.28		
Oquaga----------	0-7	7-27	1.10-1.40	0.6-2.0	0.08-0.17	4.5-6.0	Low----------	0.20	3	---
	7-32	7-27	1.20-1.50	0.6-2.0	0.04-0.12	4.5-6.0	Low----------	0.20		
	32	---	---	---	---	---	----------	----		
Ho*----------	0-8	15-27	1.20-1.40	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.28	5	2-5
Holly	8-37	18-30	1.20-1.50	0.2-2.0	0.17-0.21	5.1-7.3	Low----------	0.28		
	37-60	10-27	1.20-1.40	0.6-6.0	0.07-0.18	5.6-7.3	Low----------	0.28		
Ln*----------	0-9	10-18	1.20-1.40	2.0-6.0	0.14-0.18	4.5-6.0	Low----------	0.37	4	1-4
Linden	9-45	10-18	1.20-1.40	2.0-6.0	0.14-0.18	4.5-6.0	Low----------	0.37		
	45-60	5-25	1.20-1.40	6.0-20	0.05-0.08	4.5-6.0	Low----------	0.17		
LoB, LoC, LoD----	0-7	8-18	1.10-1.40	0.6-2.0	0.11-0.17	4.5-6.5	Low----------	0.20	3	2-6
Lordstown	7-31	8-18	1.20-1.50	0.6-2.0	0.10-0.16	4.5-6.0	Low----------	0.28		
	31-34	5-18	1.20-1.50	0.6-2.0	0.05-0.14	4.5-6.0	Low----------	0.28		
	34	---	---	---	---	---	----------	----		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				Pct
LpB, LpD----------	0-7	8-18	1.10-1.40	0.6-2.0	0.11-0.17	4.5-6.5	Low----------	0.20	3	---
Lordstown	7-31	5-26	1.20-1.50	0.6-2.0	0.10-0.16	4.5-6.0	Low----------	0.28		
	31-34	5-18	1.20-1.50	0.6-2.0	0.05-0.14	4.5-6.0	Low----------	0.28		
	34	---	---	---	---	---	----------	----		
MaB, MaC, MaD----	0-8	10-18	1.10-1.40	0.6-2.0	0.11-0.17	4.5-6.5	Low----------	0.24	3	3-7
Mardin	8-20	10-18	1.20-1.50	0.6-2.0	0.09-0.16	4.5-6.5	Low----------	0.24		
	20-57	10-18	1.70-2.00	<0.2	0.01-0.03	4.5-7.3	Low----------	0.24		
	57-60	10-18	1.65-1.95	<0.2	0.01-0.03	5.1-7.8	Low----------	0.24		
MbB, MbD----------	0-8	10-18	1.10-1.40	0.6-2.0	0.11-0.17	3.6-6.5	Low----------	0.24	3	3-7
Mardin	8-20	10-18	1.20-1.50	0.6-2.0	0.09-0.16	3.6-6.5	Low----------	0.24		
	20-57	10-18	1.70-2.00	<0.2	0.01-0.03	4.5-7.3	Low----------	0.24		
	57-60	10-18	1.65-1.95	<0.2	0.01-0.03	5.1-8.4	Low----------	0.24		
Md*.										
Medisaprists										
MoB, MoC----------	0-16	15-25	1.20-1.40	0.6-2.0	0.10-0.14	4.5-6.0	Low----------	0.2	3	1-3
Morris	16-60	15-32	1 30-1.70	<0.2	0.06-0.08	4.5-6.5	Low----------	0.24		
MsB, MsD----------	0-16	15-25	1.20-1.40	0.6-2.0	0.12-0.16	4.5-6.0	Low----------	0.15	3	---
Morris	16-60	15-32	1.30-1.70	<0.2	0.06-0.08	4.5-6.5	Low----------	0.24		
NoB----------	0-4	10-27	1.10-1.40	0.6-2.0	0.12-0.18	5.1-6.0	Low----------	0.24	3	---
Norwich	4-20	18-27	1.20-1.50	0.6-2.0	0.11-0.18	5.1-6.0	Low----------	0.24		
	20-60	10-27	1.70-2.00	<0.2	0.02-0.04	5.1-6.5	Low----------	0.24		
OcF*:										
Ochrepts.										
Rock outcrop.										
OgB, OgC, OgD----	0-7	7-27	1.10-1.40	0.6-2.0	0.08-0.17	4.5-6.0	Low----------	0.28	3	2-6
Oquaga	7-32	7-27	1.20-1.50	0.6-2.0	0.04-0.12	4.5-6.0	Low----------	0.20		
	32	---	---	---	---	---	----------	----		
OsB, OsD----------	0-7	7-27	1.10-1.40	0.6-2.0	0.08-0.17	4.5-6.0	Low----------	0.20	3	---
Oquaga	7-32	7-27	1.20-1.50	0.6-2.0	0.04-0.12	4.5-6.0	Low----------	0.20		
	32	---	---	---	---	---	----------	----		
Po*----------	0-10	5-15	1.20-1.40	0.6-2.0	0.10-0.20	4.5-5.5	Low----------	0.28	5	1-4
Pope	10-40	5-18	1.20-1.50	0.6-6.0	0.07-0.15	4.5-5.5	Low----------	0.28		
	40-60	5-20	1.20-1.50	0.6-6.0	0.06-0.15	4.5-5.5	Low----------	0.28		
ReA, ReB, ReC----	0-18	10-20	1.20-1.40	0.6-2.0	0.14-0.18	5.1-6.0	Low----------	0.24	3	1-3
Rexford	18-42	10-18	1.20-1.40	0.06-0.2	0.04-0.08	5.1-6.5	Low----------	0.28		
	42-60	5-15	1.20-1.40	>2.0	0.03-0.06	5.1-6.5	Low----------	0.17		
Uc*.										
Udifluvents										
Ud*.										
Udorthents										
UnB----------	0-10	2-18	1.20-1.50	0.6-2.0	0.18-0.21	4.5-6.0	Low----------	0.49	3	2-7
Unadilla	10-55	1-18	1.20-1.50	0.6-2.0	0.17-0.20	4.5-6.0	Low----------	0.64		
	55-60	1-3	1.45-1.65	2.0-20.0	0.01-0.07	5.1-7.8	Low----------	0.17		
UnC----------	0-10	2-18	1.20-1.50	0.6-2.0	0.18-0.21	4.5-6.0	Low----------	0.49	3	2-7
Unadilla	10-55	1-18	1.20-1.50	0.6-2.0	0.17-0.20	4.5-6.0	Low----------	0.64		
	55-60	1-3	1.45-1.65	2.0-20.0	0.01-0.07	5.1-7.8	Low----------	0.17		
VoB, VoC, VoD----	0-8	18-27	1.10-1.40	0.6-2.0	0.11-0.17	5.1-6.5	Low----------	0.24	3	2-7
Volusia	8-14	18-27	1.30-1.60	0.6-2.0	0.09-0.16	5.1-6.5	Low----------	0.24		
	14-50	15-35	1.70-2.00	<0.2	0.01-0.02	5.1-7.3	Low----------	0.24		
	50-60	15-27	1.65-1.95	<0.2	0.01-0.02	5.6-8.4	Low----------	0.24		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				Pct
VsB, VsD----------	0-8	18-27	1.10-1.40	0.6-2.0	0.11-0.17	5.1-6.5	Low----------	0.24	3	---
Volusia	8-14	18-27	1.30-1.60	0.6-2.0	0.09-0.16	5.1-6.5	Low----------	0.24		
	14-50	15-35	1.70-2.00	<0.2	0.01-0.02	5.1-7.3	Low----------	0.24		
	50-60	15-27	1.65-1.95	<0.2	0.01-0.02	5.6-8.4	Low----------	0.24		
WbB, WbC, WbD----	0-8	15-25	1.20-1.40	0.6-2.0	0.10-0.14	4.5-6.0	Low----------	0.24	3	1-3
Wellsboro	8-20	15-27	1.30-1.50	0.6-2.0	0.10-0.14	4.5-6.0	Low----------	0.28		
	20-60	15-27	1.30-1.60	0.06-0.2	0.06-0.10	4.5-6.0	Low----------	0.28		
WgB, WgD----------	0-8	15-25	1.20-1.40	0.6-2.0	0.10-0.16	4.5-6.0	Low----------	0.15	3	---
Wellsboro	8-20	15-27	1.30-1.50	0.6-2.0	0.10-0.14	4.5-6.0	Low----------	0.28		
	20-60	15-27	1.30-1.60	0.06-0.2	0.06-0.10	4.5-6.0	Low----------	0.28		
WmB, WmC, WmD,										
WmF, WoC---------	0-9	8-18	1.10-1.40	6.0-20	0.06-0.14	4.5-6.0	Low----------	0.17	3	2-4
Wyoming	9-26	5-15	1.10-1.50	6.0-20	0.06-0.09	4.5-6.0	Low----------	0.17		
	26-60	1-11	1.30-1.60	6.0-20	0.02-0.04	4.5-6.0	Low----------	0.17		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the text explain terms such as "rare," "brief," "apparent," and "perched." The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
AgB---------- Alton	A	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
Ao*. Aquepts												
ArC---------- Arnot	C/D	None--------	---	---	>3.0	Perched	Nov-Mar	10-20	Hard	Moderate	Low------	High.
AsD*: Arnot----------	C/D	None--------	---	---	>3.0	Perched	Nov-Mar	10-20	Hard	Moderate	Low------	High.
Rock outcrop.												
BaB---------- Braceville	C	None--------	---	---	1.0-3.0	Perched	Nov-Mar	60	---	Moderate	Moderate	Moderate.
CaA---------- Canadice	D	None--------	---	---	+1-0.5	Apparent	Dec-Jun	>60	---	Moderate	High-----	Low.
CnB---------- Chenango	A	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
CpA, CpB---------- Chippewa	D	None--------	---	---	0-0.5	Apparent	Nov-May	>60	---	High-----	High-----	Moderate.
Du*. Dumps												
DyF*: Dystrochrepts.												
Wellsboro--------	C	None--------	---	---	1.0-3.0	Perched	Nov-Mar	>60	---	High-----	High-----	Moderate.
Oquaga----------	C	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	Low------	Moderate.
Ho*---------- Holly	B/D	Frequent----	Very brief to brief.	Nov-May	0-0.5	Apparent	Dec-May	>60	---	High-----	High-----	Moderate.
Ln*---------- Linden	B	Rare to common.	Very brief to brief.	Jan-Apr	3.0-6.0	Apparent	Nov-Mar	>60	---	Moderate	Low------	High.
LoB, LoC, LoD, LpB, LpD---------- Lordstown	C	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	Low------	High.
MaB, MaC, MaD, MbB, MbD---------- Mardin	C	None--------	---	---	1.5-2.0	Perched	Mar-May	>60	---	Moderate	Moderate	Low.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Md*. Medisaprists												
MoB, MoC, MsB, MsD---------- Morris	C	None--------	---	---	0.5-1.0	Perched	Nov-Mar	>60	---	High-----	High-----	Moderate.
NoB---------- Norwich	D	None--------	---	---	0-0.5	Apparent	Nov-May	>60	---	High-----	High-----	Moderate.
OcF*: Ochrepts.												
Rock outcrop.												
OgB, OgC, OgD, OsB, OsD--------- Oquaga	C	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	Low------	Moderate.
Po*---------- Pope	B	Occasional	Very brief	Jan-Apr	>6.0	---	---	>60	---	Moderate	Low------	High.
ReA, ReB, ReC----- Rexford	C	None--------	---	---	0-1.5	Perched	Oct-May	>60	---	High-----	High-----	High.
Uc*. Udifluvents												
Ud*. Udorthents												
UnB, UnC---------- Unadilla	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low------	Moderate.
VoB, VoC, VoD, VsB, VsD--------- Volusia	C	None--------	---	---	0.5-1.5	Perched	Dec-May	>60	---	High-----	High-----	Moderate.
WbB, WbC, WbD, WgB, WgD--------- Wellsboro	C	None--------	---	---	1.5-3.0	Perched	Nov-Mar	>60	---	High-----	High-----	Moderate.
WmB, WmC, WmD, WmF, WoC--------- Wyoming	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	High.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Alton	Loamy-skeletal, mixed, mesic Dystric Eutrochrepts
Aquepts	Aquepts
Arnot	Loamy-skeletal, mixed, mesic Lithic Dystrochrepts
Braceville	Coarse-loamy, mixed, mesic Typic Fragiochrepts
Canadice	Fine, illitic, mesic Typic Ochraqualfs
Chenango	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Chippewa	Fine-loamy, mixed, mesic Typic Fragiaquepts
Dystrochrepts	Dystrochrepts
Holly	Fine-loamy, mixed, nonacid, mesic Typic Fluvaquents
Linden	Coarse-loamy, mixed, mesic Fluventic Dystrochrepts
Lordstown	Coarse-loamy, mixed, mesic Typic Dystrochrepts
Mardin	Coarse-loamy, mixed, mesic Typic Fragiochrepts
Medisaprists	Medisaprists
Morris	Coarse-loamy, mixed, mesic Aeric Fragiaquepts
Norwich	Fine-loamy, mixed, mesic Typic Fragiaquepts
Ochrepts	Ochrepts
Oquaga	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Pope	Coarse-loamy, mixed, mesic Fluventic Dystrochrepts
Rexford	Coarse-loamy, mixed, mesic Aeric Fragiaquepts
Udifluvents	Udifluvents
Udorthents	Udorthents
Unadilla	Coarse-silty, mixed, mesic Typic Dystrochrepts
Volusia	Fine-loamy, mixed, mesic Aeric Fragiaquepts
Wellsboro	Coarse-loamy, mixed, mesic Typic Fragiochrepts
Wyoming	Loamy-skeletal, mixed, mesic Typic Dystrochrepts

*U.S. GOVERNMENT PRINTING OFFICE: 1986-327-950:40007

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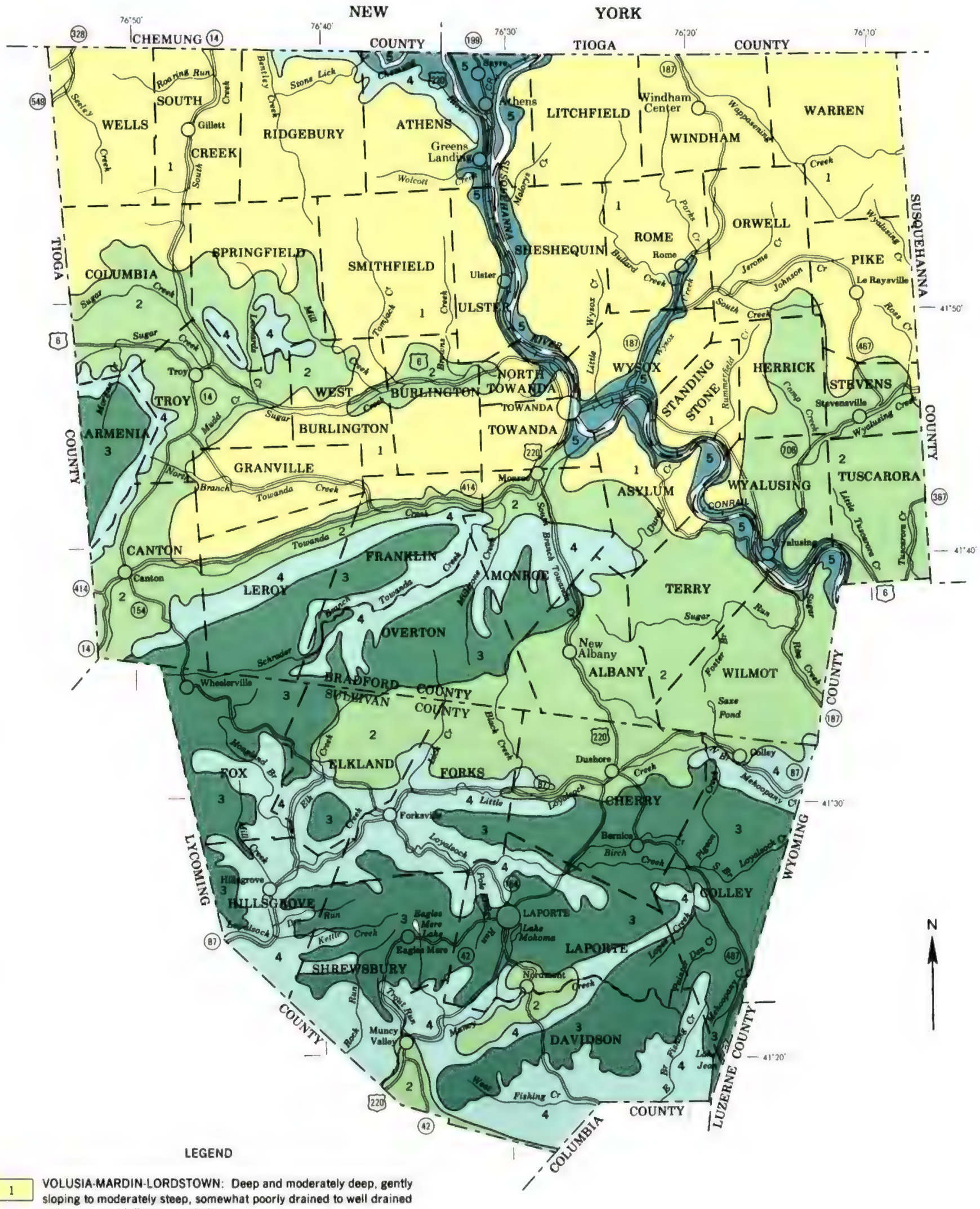


LEGEND

1 VOLUSIA-MARDIN-LORDSTOWN: Deep and moderately deep, gently sloping to moderately steep, somewhat poorly drained to well drained soils; on broad hillsides and hilltops

2 MORRIS-OQUAGA-WELLSBORO: Deep and moderately deep, sloping to steep, somewhat poorly drained to somewhat excessively drained soils; on narrow hillsides and hilltops

3 WELLSBOBO-OQUAGA-MORRIS: Deep and moderately deep, gently sloping to moderately steep, somewhat excessively drained to somewhat poorly drained soils; on broad plateaus and mountaintops

4 DYSTROCHREPTS-OQUAGA-WELLSBORO: Deep and moderately deep, moderately steep to very steep, somewhat excessively drained to somewhat poorly drained soils; on mountainsides and in narrow stream valleys

5 ALTON-POPE-CHENANGO: Deep, nearly level and gently sloping, somewhat excessively drained and well drained soils; on uplands, terraces and flood plains

Compiled 1982

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
PENNSYLVANIA STATE UNIVERSITY, COLLEGE OF AGRICULTURE
PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES
STATE CONSERVATION COMMISSION

GENERAL SOIL MAP

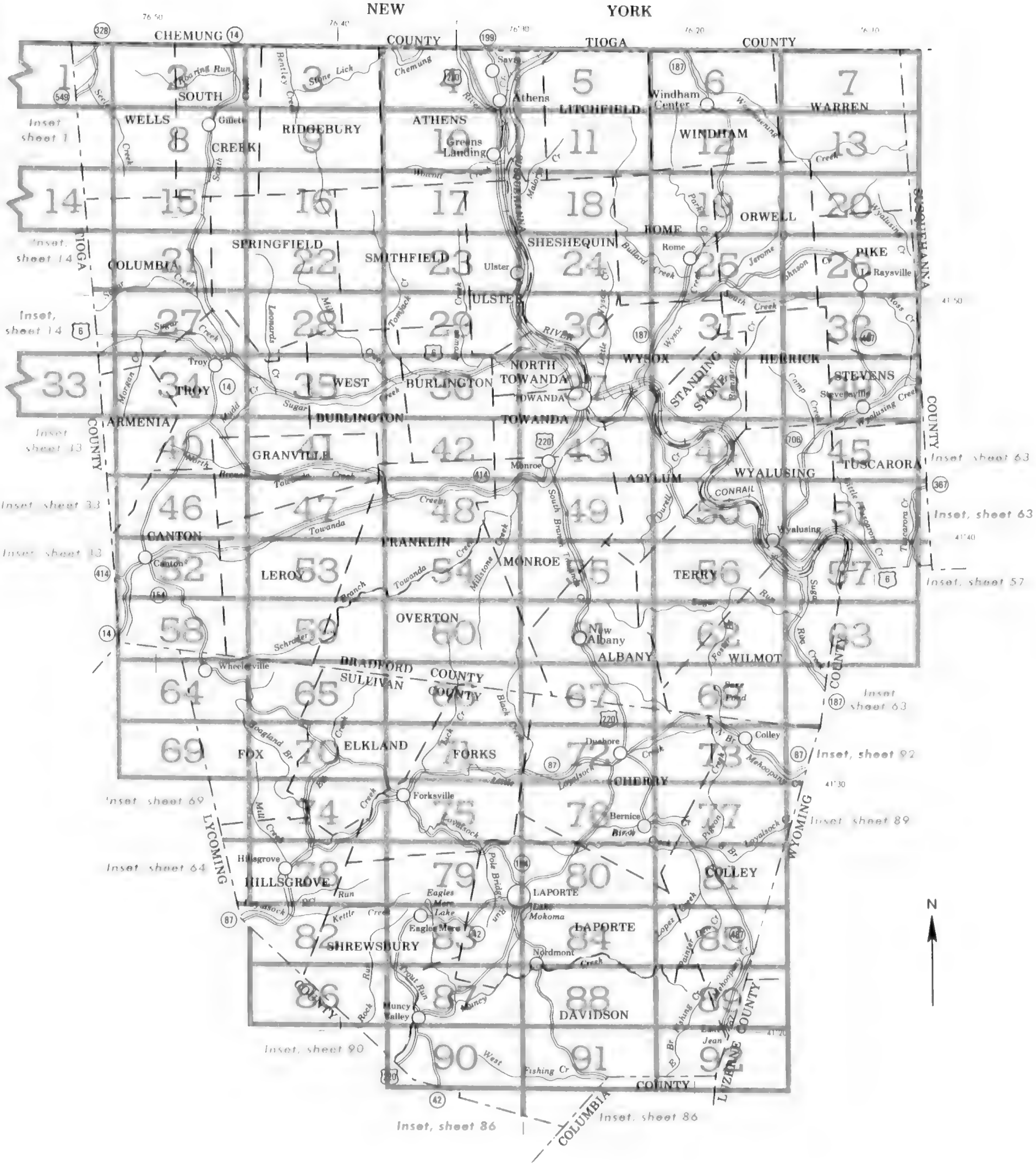
BRADFORD AND SULLIVAN COUNTIES, PENNSYLVANIA

Scale 1:253,440

1 0 1 2 3 4 Miles

1 0 4 8 Km

N



Original text from each individual map sheet read:
This soil survey map was compiled by U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by U.S. Department of the Interior, Geological Survey from 1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

INDEX TO MAP SHEETS

BRADFORD AND SULLIVAN COUNTIES, PENNSYLVANIA

Scale 1:316 800

1 0 1 2 3 4 5 Miles

1 0 1 2 3 4 5 Kilometers

SOIL LEGEND

SYMBOL	NAME
AgB	Alton gravelly sandy loam, 0 to 8 percent slopes
Ao	Aquepts, rubbly
ArC	Arnot very channery loam, rocky, 3 to 15 percent slopes
AsD	Arnot-Rock outcrop complex, 3 to 25 percent slopes
BaB	Braceville silt loam, 0 to 8 percent slopes
CaA	Canadice silty clay loam, 0 to 3 percent slopes
CnB	Chenango gravelly loam, 0 to 8 percent slopes
CpA	Chippewa silt loam, 0 to 3 percent slopes
CpB	Chippewa silt loam, 3 to 8 percent slopes
Du	Dumps, mine
DyF	Dystrochrepts, deep-Wellsboro-Oquaga association, steep
Ho	Holly soils
Ln	Linden soils
LoB	Lordstown channery silt loam, 3 to 8 percent slopes
LoC	Lordstown channery silt loam, 8 to 15 percent slopes
LoD	Lordstown channery silt loam, 15 to 25 percent slopes
LpB	Lordstown very stony silt loam, 3 to 8 percent slopes
LpD	Lorustown very stony silt loam, 8 to 25 percent slopes
MaB	Mardin channery silt loam, 3 to 8 percent slopes
MaC	Mardin channery silt loam, 8 to 15 percent slopes
MaD	Mardin channery silt loam, 15 to 25 percent slopes
MbB	Mardin very stony silt loam, 3 to 8 percent slopes
MbD	Mardin very stony silt loam, 8 to 25 percent slopes
Md	Medisaprists, ponded
MoB	Morris channery silt loam, 3 to 8 percent slopes
MoC	Morris channery silt loam, 8 to 15 percent slopes
MsB	Morris very stony silt loam, 3 to 8 percent slopes
MsD	Morris very stony silt loam, 8 to 25 percent slopes
NoB	Norwich very stony silt loam, 0 to 8 percent slopes
OcF	Ochrepts-Rock outcrop complex, steep
OgB	Oquaga channery silt loam, 3 to 8 percent slopes
OgC	Oquaga channery silt loam, 8 to 15 percent slopes
OgD	Oquaga channery silt loam, 15 to 25 percent slopes
OsB	Oquaga extremely stony silt loam, 3 to 8 percent slopes
OsD	Oquaga extremely stony silt loam, 8 to 25 percent slopes
Po	Pope soils
ReA	Rexford silt loam, 0 to 3 percent slopes
ReB	Rexford silt loam, 3 to 8 percent slopes
ReC	Rexford silt loam, 8 to 12 percent slopes
Uc	Udifluvents, cobbly
Ud	Udorthents, very channery
UnB	Unadilla silt loam, 3 to 8 percent slopes
UnC	Unadilla silt loam, 8 to 15 percent slopes
VoB	Volusia channery silt loam, 3 to 8 percent slopes
VoC	Volusia channery silt loam, 8 to 15 percent slopes
VoD	Volusia channery silt loam, 15 to 25 percent slopes
VsB	Volusia very stony silt loam, 3 to 8 percent slopes
VsD	Volusia very stony silt loam, 8 to 25 percent slopes
WbB	Wellsboro channery silt loam, 3 to 8 percent slopes
WbC	Wellsboro channery silt loam, 8 to 15 percent slopes
WbD	Wellsboro channery silt loam, 15 to 25 percent slopes
WgB	Wellsboro very stony silt loam, 3 to 8 percent slopes
WgD	Wellsboro very stony silt loam, 8 to 25 percent slopes
WmB	Wyoming gravelly sandy loam, 3 to 8 percent slopes
WmC	Wyoming gravelly sandy loam, 8 to 15 percent slopes
WmD	Wyoming gravelly sandy loam, 15 to 25 percent slopes
WmF	Wyoming gravelly sandy loam, 25 to 45 percent slopes
WoC	Wyoming very stony sandy loam, 3 to 15 percent slopes

The first component always a capital letter, is the initial letter of the soil name. The second component is a lower case letter. The third component, the capital letter A, B, C, D, or F is the slope class. Most symbols with a letter for slope class are for nearly level soils, but some are for soils that have a considerable range of slope and one is for a miscellaneous area.

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline & neatline
- AD HOC BOUNDARY (label) — Harden Airstrip
- Small airport, airfield, park, oilfield, cemetery, or flood pool — Pool Line
- STATE COORDINATE TICK
- LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate — 21
- Federal — 1173
- State — 28
- County, farm or ranch — 1283

- RAILROAD
- POWER TRANSMISSION LINE (normally not shown)
- PIPE LINE (normally not shown)
- FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or small — water

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label) — Indian Mound
- Located object (label) — Tower
- Tank (label) — Gas
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) — CANAL
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial — water
- Intermittent — int

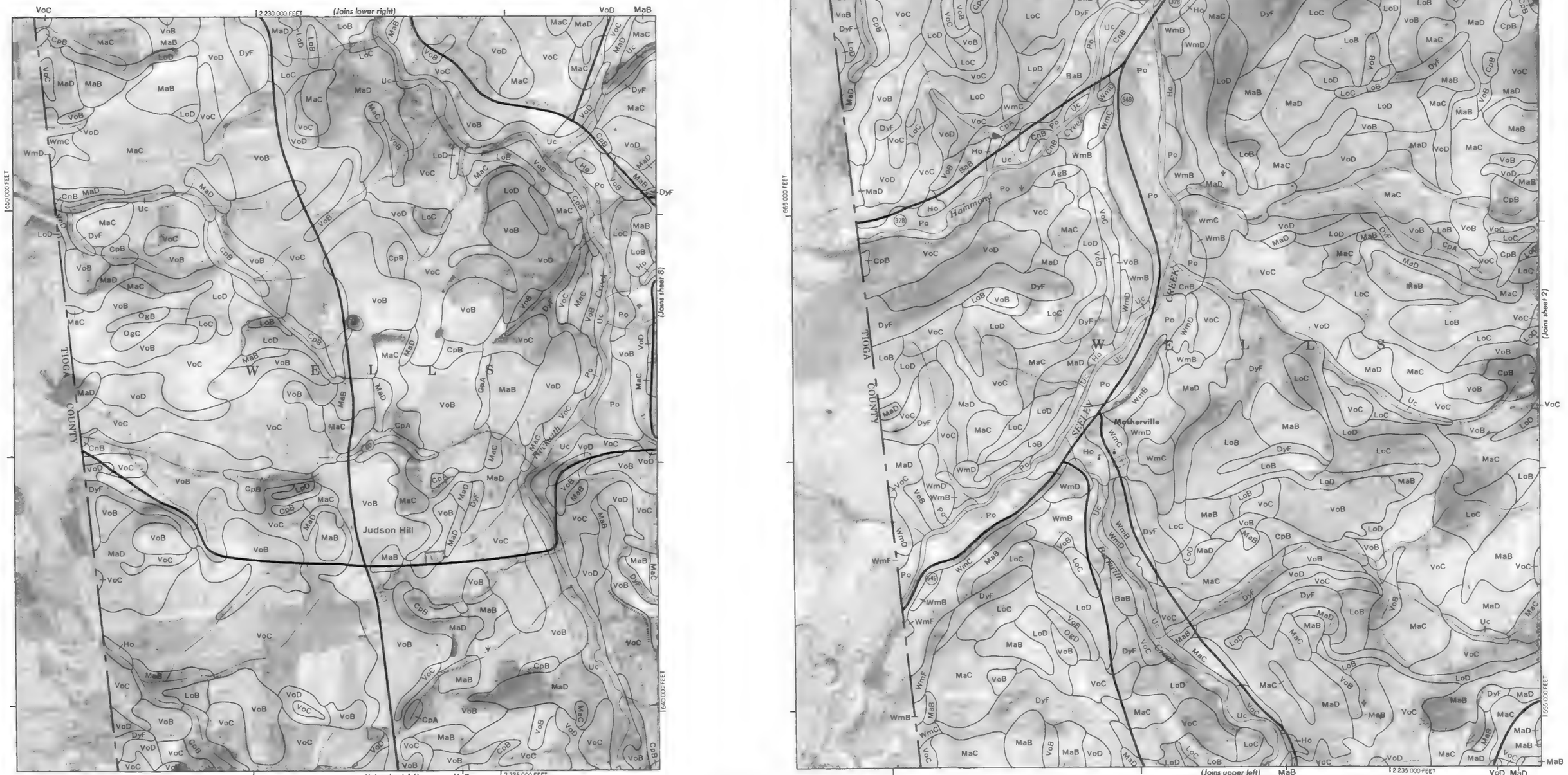
MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

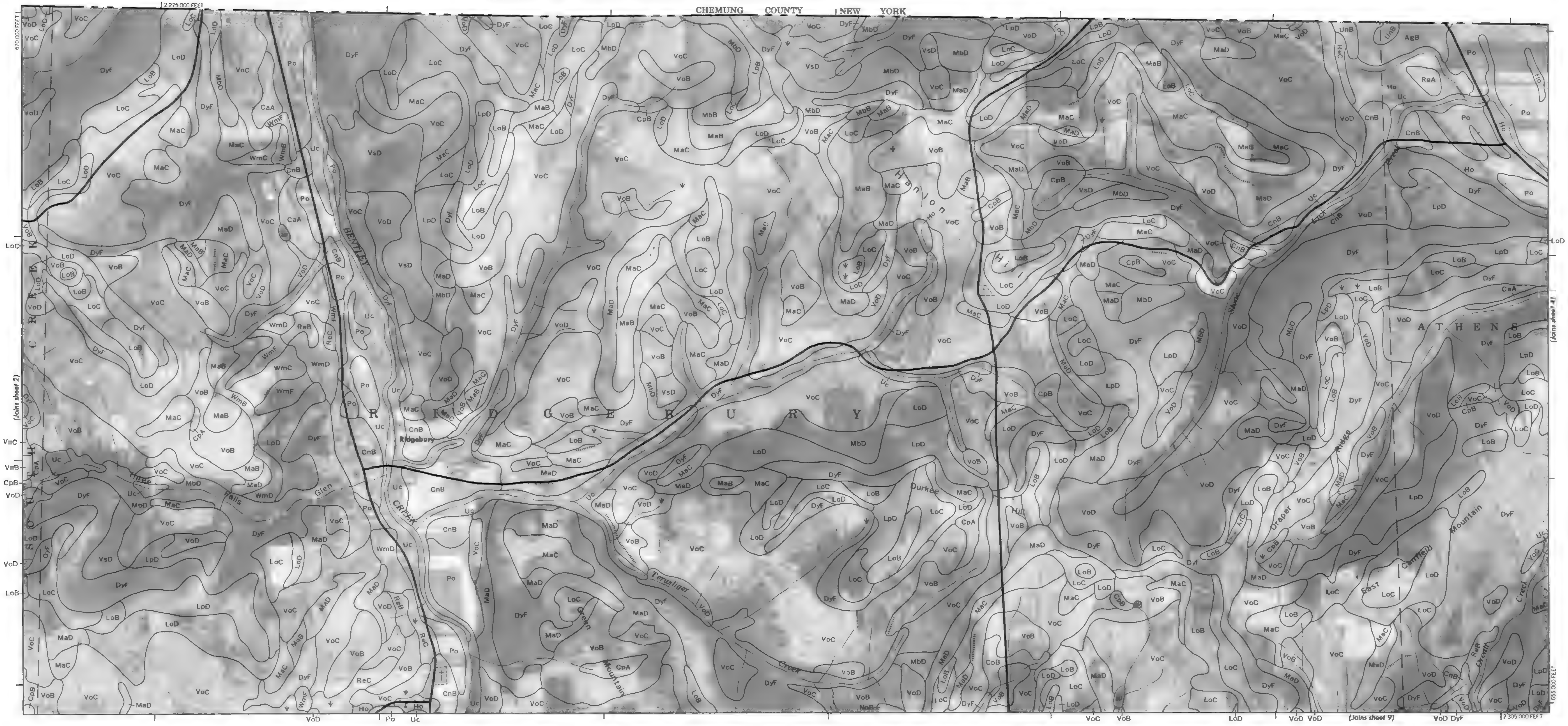
SPECIAL SYMBOLS FOR SOIL SURVEY

- SOIL DELINEATIONS AND SYMBOLS — CnB / WaC2
- ESCARPMENTS
  - Bedrock (points down slope)
  - Other than bedrock (points down slope)
- SHORT STEEP SLOPE
- GULLY
- DEPRESSION OR SINK
- SOIL SAMPLE SITE (normally not shown) — S
- MISCELLANEOUS
  - Blowout
  - Clay spot
  - Gravelly spot
  - Gumbo, slick or scabby spot (sodic)
  - Dumps and other similar non soil areas
  - Prominent hill or peak
  - Rock outcrop (includes sandstone and shale)
  - Saline spot
  - Sandy spot
  - Severely eroded spot
  - Slide or slip (tips point upslope)
  - Stony spot, very stony spot — 0

BRADFORD AND SULLIVAN COUNTIES, PENNSYLVANIA — SHEET NUMBER 1



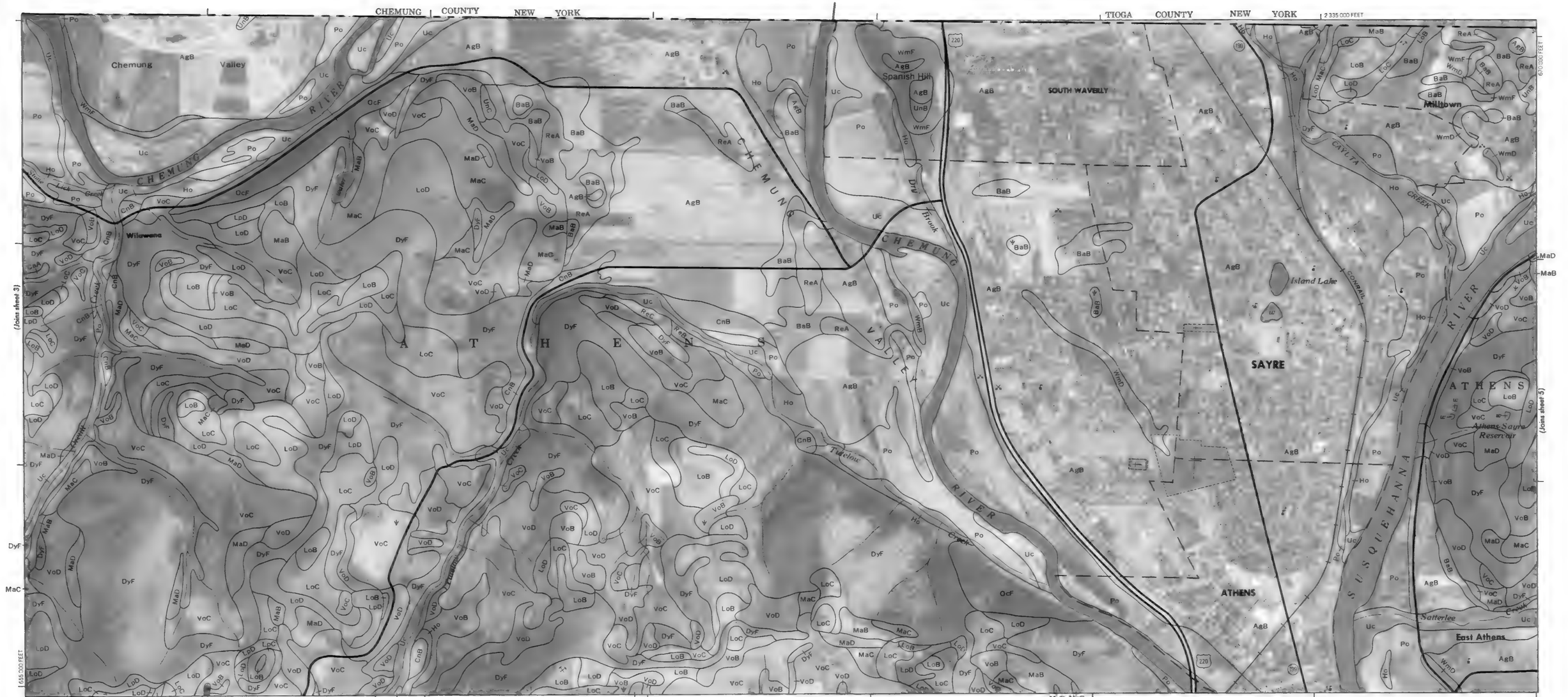
BRADFORD AND SULLIVAN COUNTIES, PENNSYLVANIA — SHEET NUMBER 2

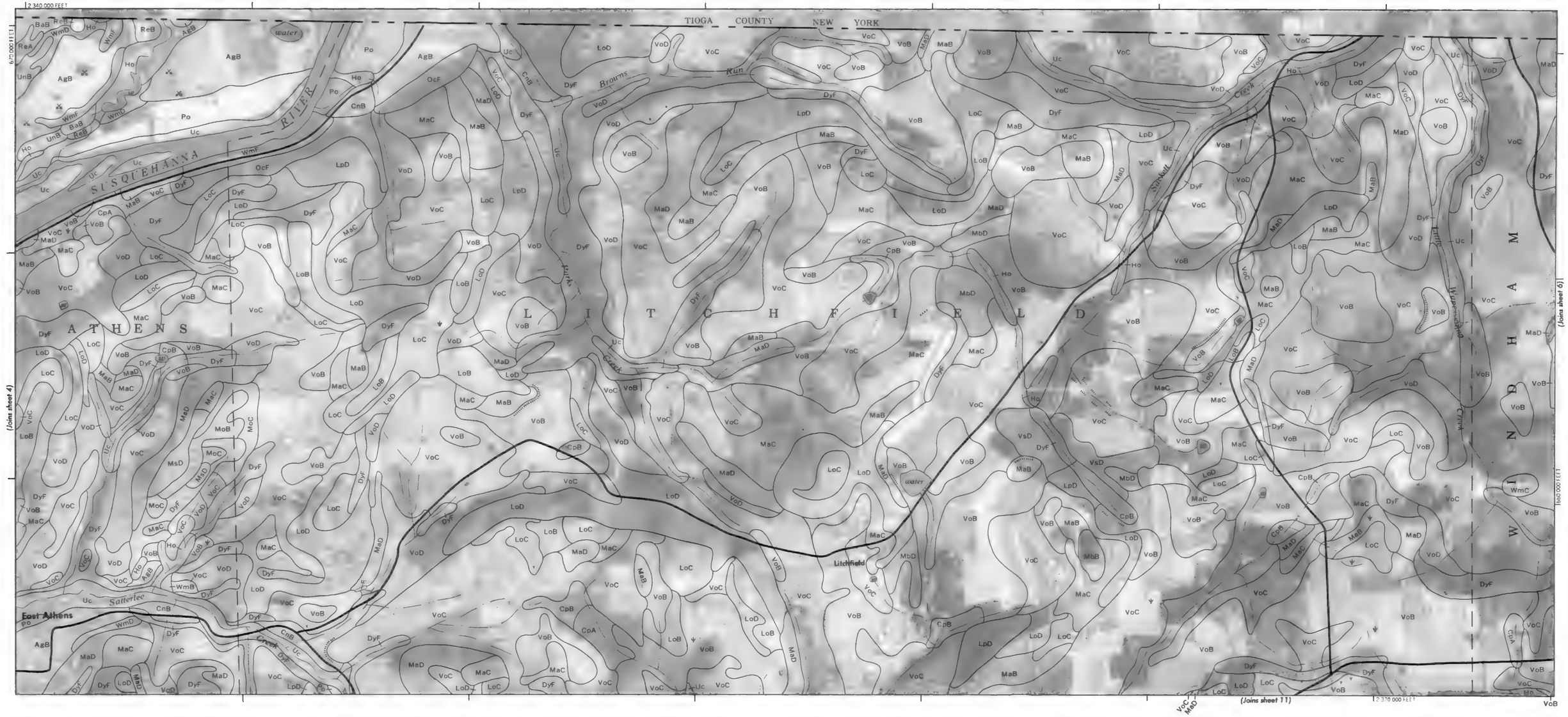


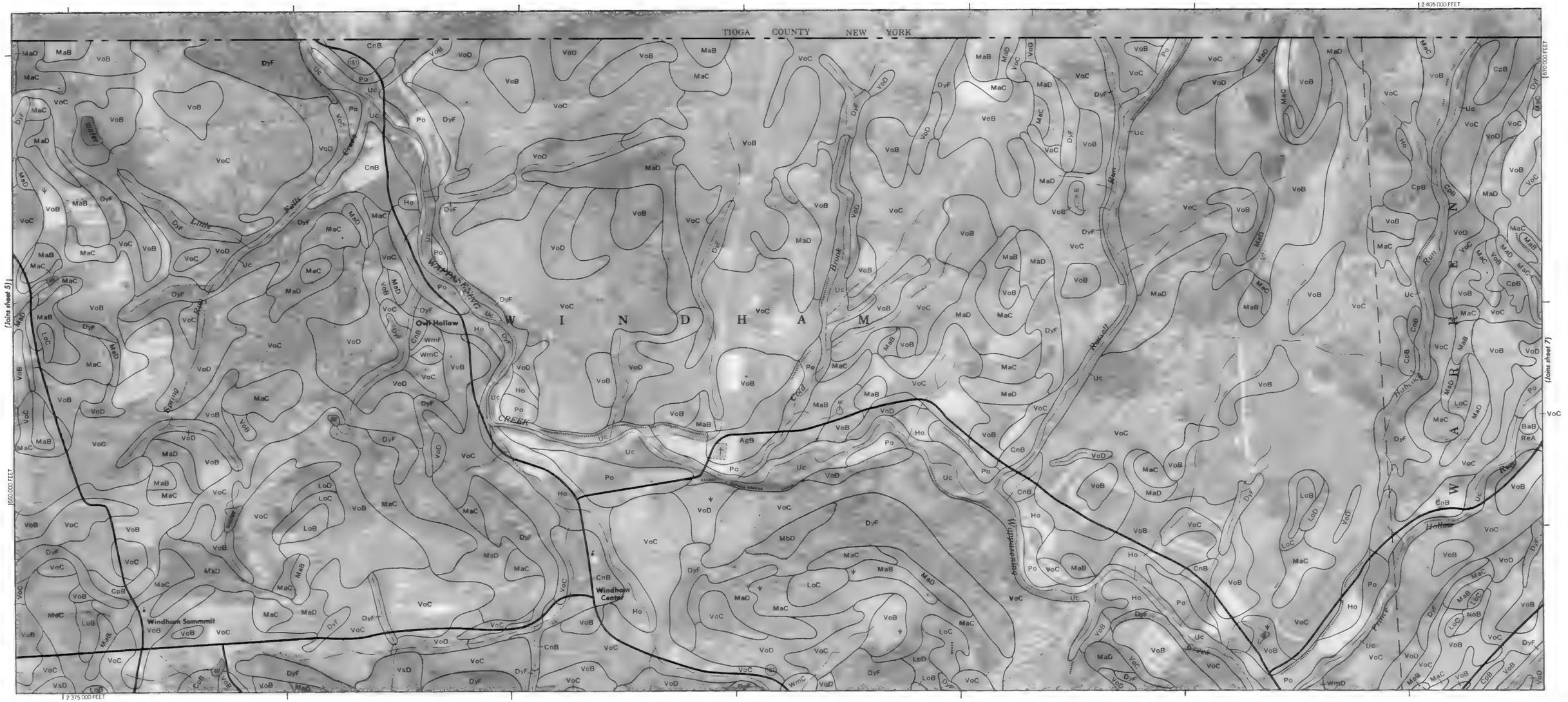
1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000


CHEMUNG COUNTY NEW YORK
TIOGA COUNTY NEW YORK
2 335 000 FEET
670 000 FEET
655 000 FEET
2 310 000 FEET
N
Chemung
Valley
Wilawana
Spanish Hill
SOUTH WAVERLY
Milltown
SAYRE
ATHENS
East Athens
Satterlee
Island Lake
Athens-Sayre Reservoir
CHEMUNG RIVER
SUSQUEHANNA RIVER
CAYUTA CREEK
Dry Brook
Tuttle Creek
Trout Creek
CONRAIL
ATHENS VALLEY
(Joins sheet 3)
(Joins sheet 5)
(Joins sheet 10)
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

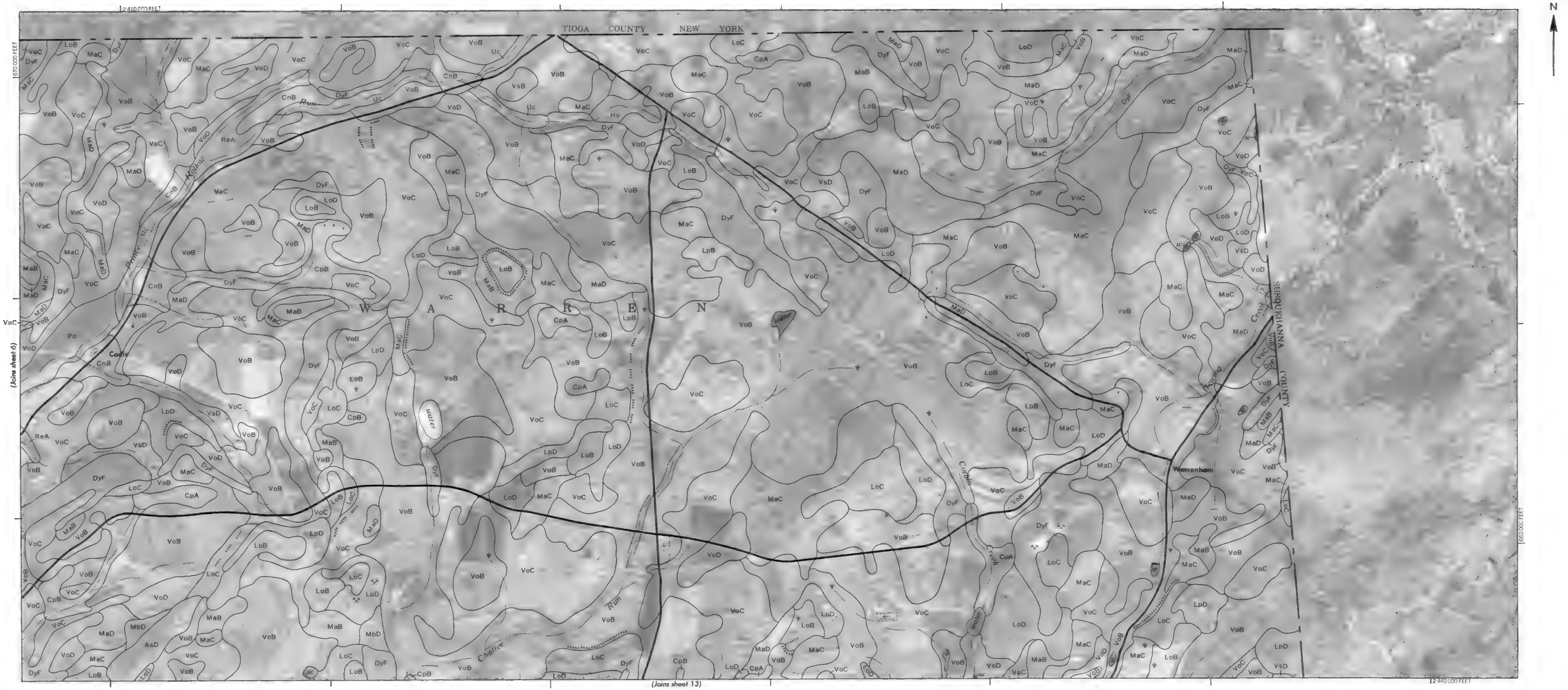

2 340 000 FEET
670 000 FEET
TIOGA COUNTY NEW YORK
SUSQUEHANNA RIVER
ATHENS
LITCHFIELD
WINDHAM
Browns Run
Parks Creek
Satterlee Creek
Wappasening Creek
Litchfield
East Athens
(Joins sheet 4)
(Joins sheet 6)
(Joins sheet 11)
1 500 000 FEET
2 370 000 FEET
N
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000



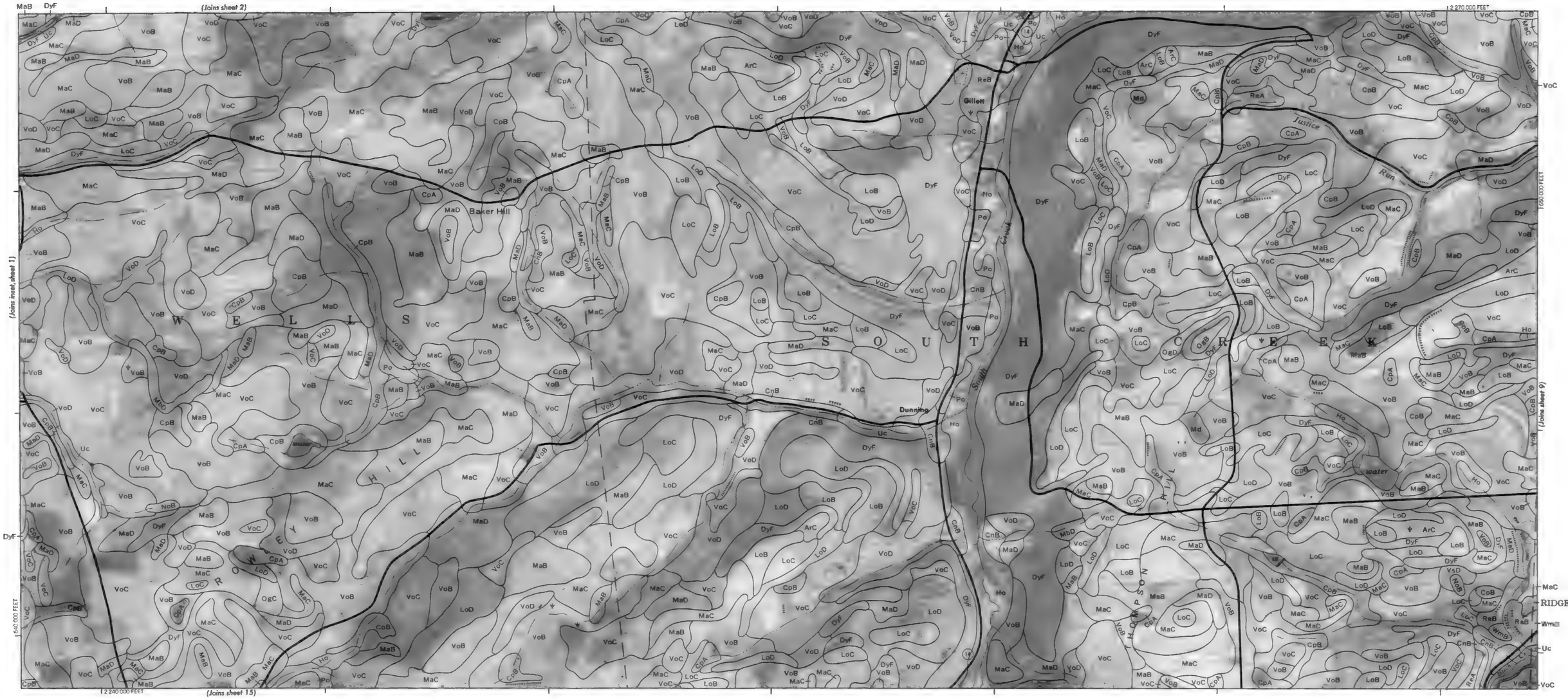
1 3/4 1/2 1/4 0 1 MILE

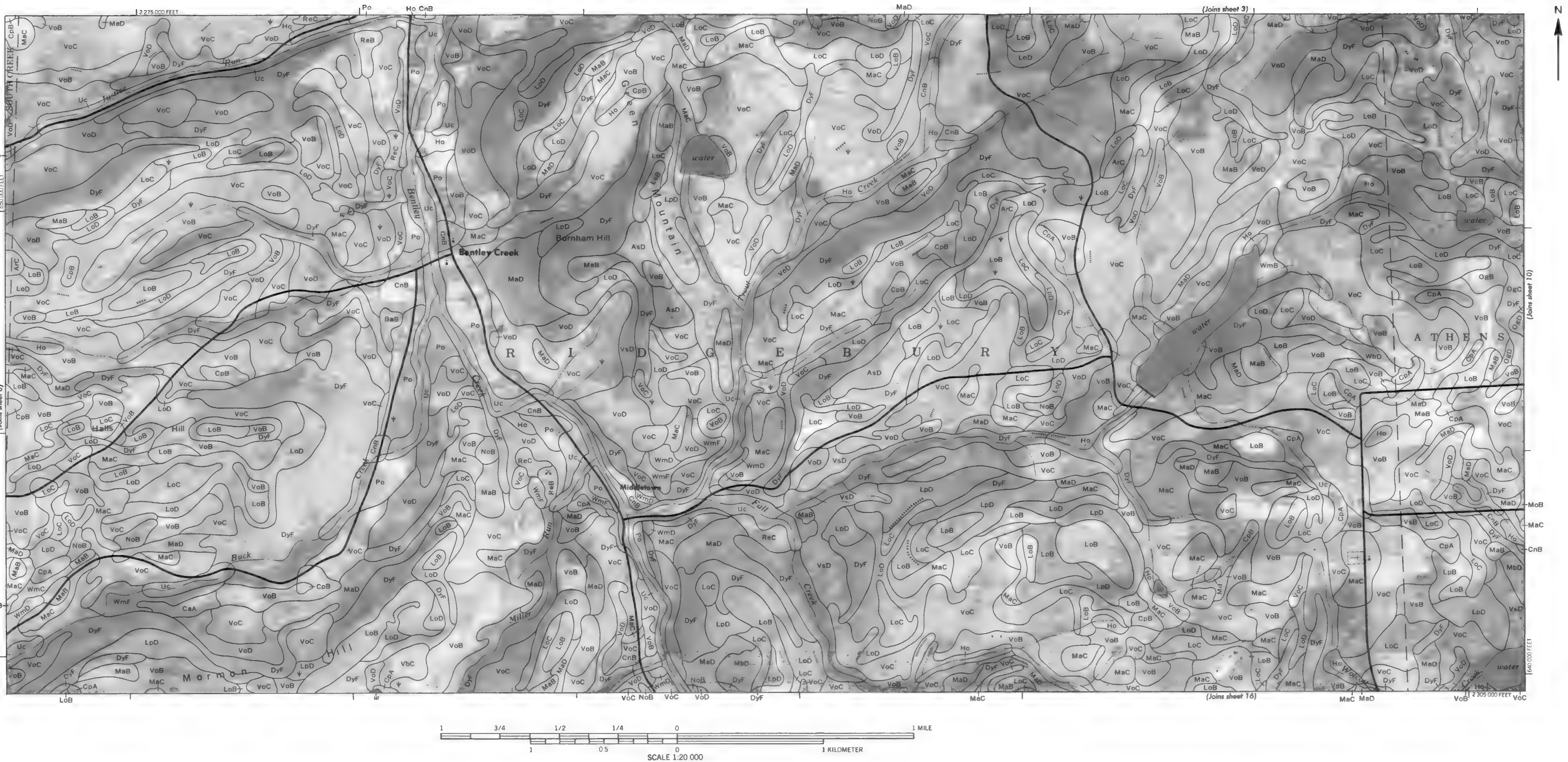
1 0.5 0 1 KILOMETER

SCALE 1:20 000

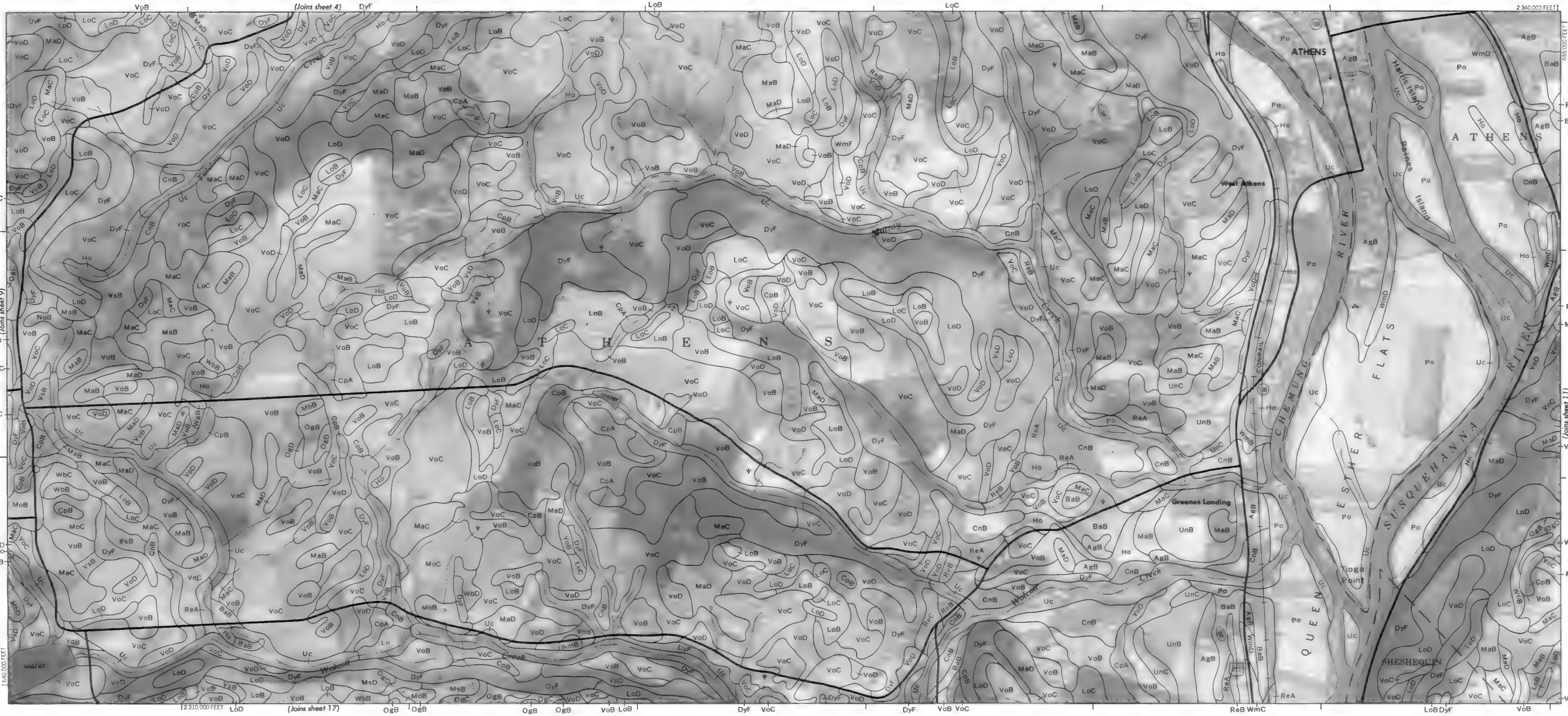


1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000


N
(Joins sheet 2)
(Joins inset, sheet 1)
(Joins sheet 9)
(Joins sheet 15)
2 240 000 FEET
2 270 000 FEET
1 640 000 FEET
1 650 000 FEET
Baker Hill
Gillett
Dunning
Justice
Run
Sugar
Creek
WELLS
SOUTH
CREEK
HILL
ROWLEY
RIDGEBURY
water
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000


9
N
(Joins sheet 3)
(Joins sheet 8)
(Joins sheet 10)
(Joins sheet 16)
2 275 000 FEET
2 305 000 FEET
650 000 FEET
640 000 FEET
Bentley Creek
Burnham Hill
Middletown
R I D G E B U R Y
A T H E N S
Halls Hill
Mormon Hill
Green Mountain
Buck
Miller Run
Fall Creek
Ho Creek
Trout
water
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

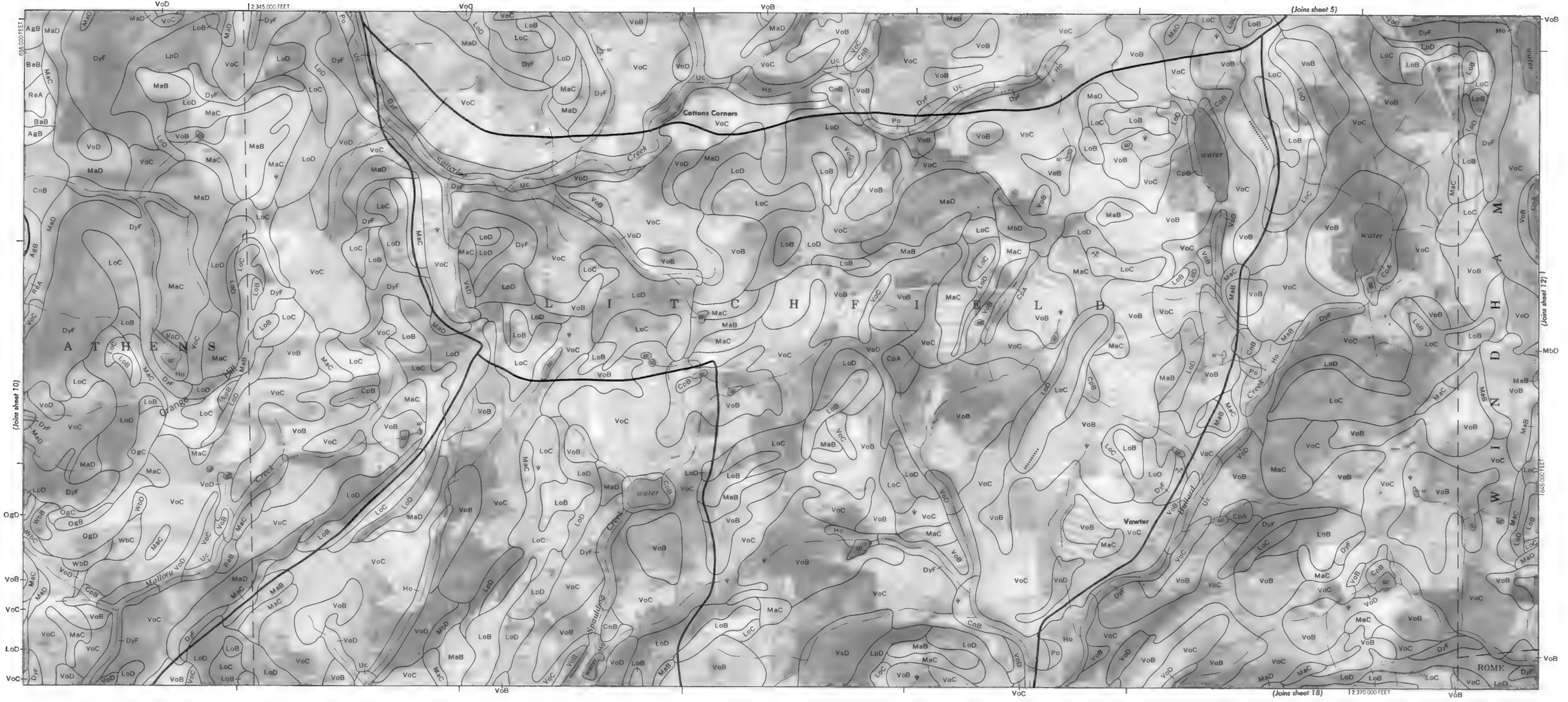
N



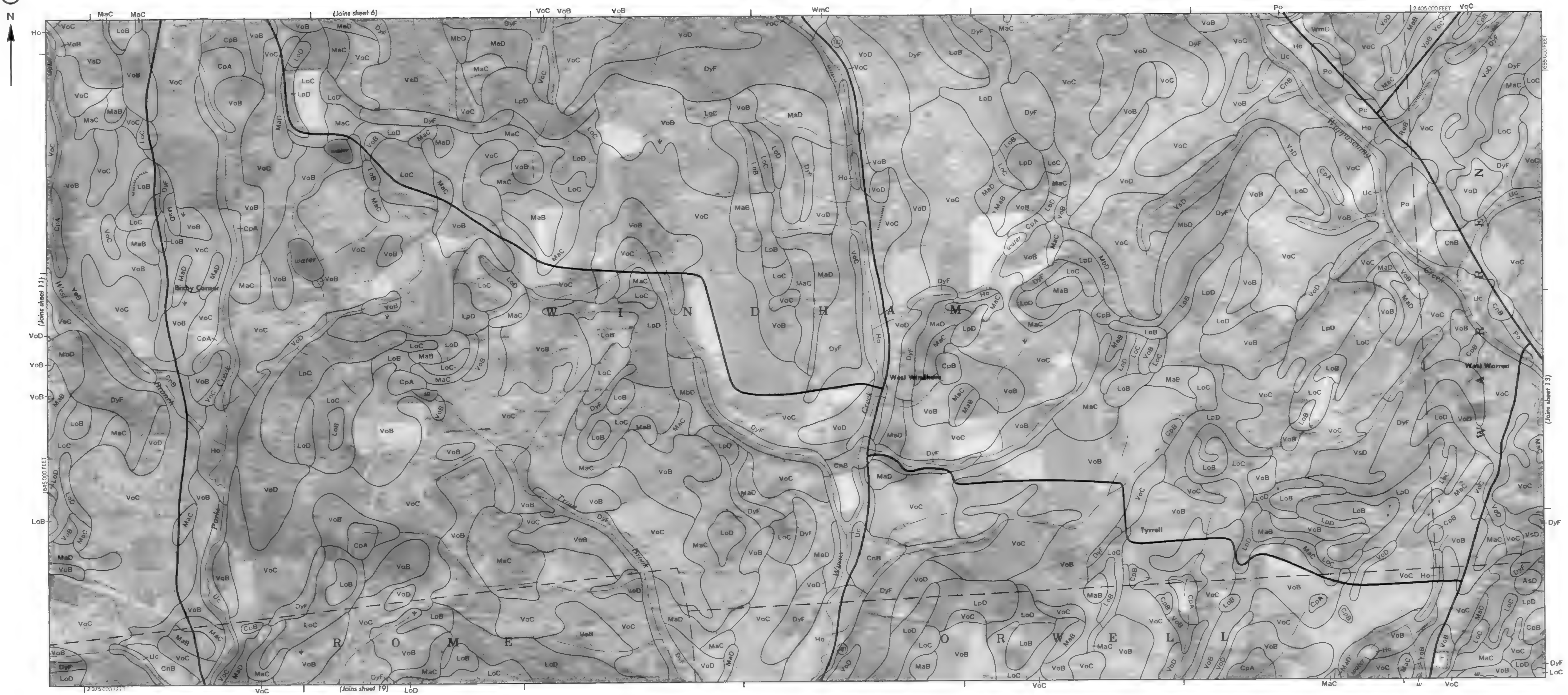
1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000


N
2 345 000 FEET
2 370 000 FEET
665 000 FEET
1645 000 FEET
(Joins sheet 5)
(Joins sheet 10)
(Joins sheet 12)
(Joins sheet 18)
Cottons Corners
Saltzer Creek
Orange Hill
Mallory Creek
Stoutsburg Creek
Barnhart Creek
Vawter
water
ATHENS
LITCHFIELD
WINDHAM
ROME
1 MILE
1 KILOMETER
SCALE 1:20 000

(12)



1 3/4 1/2 1/4 0 1 MILE

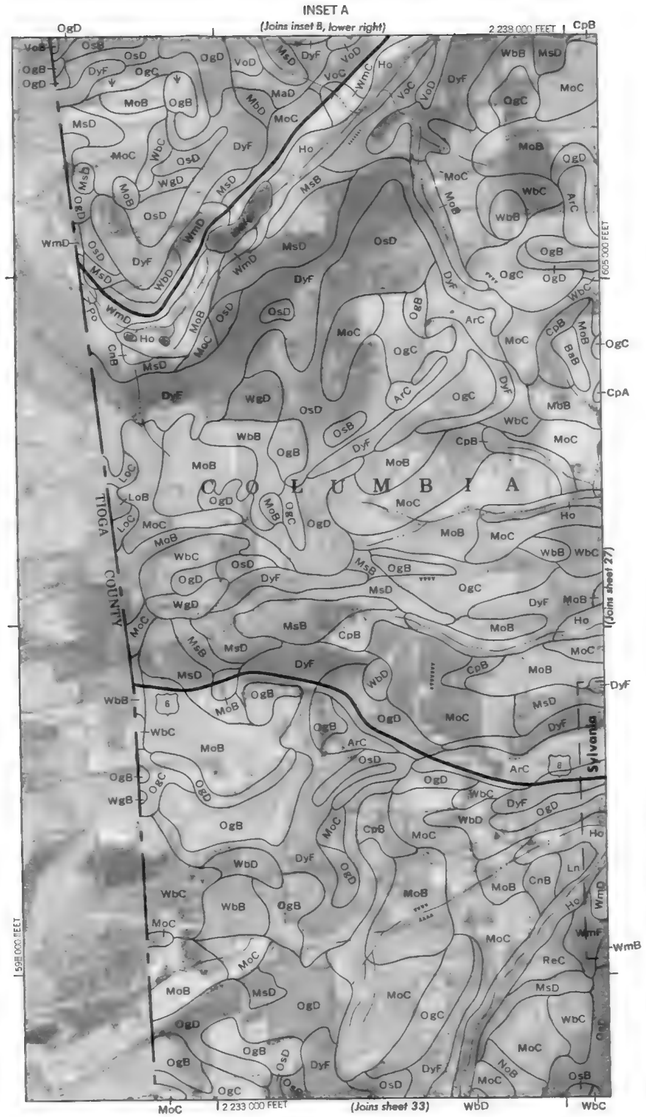
1 0.5 0 1 KILOMETER

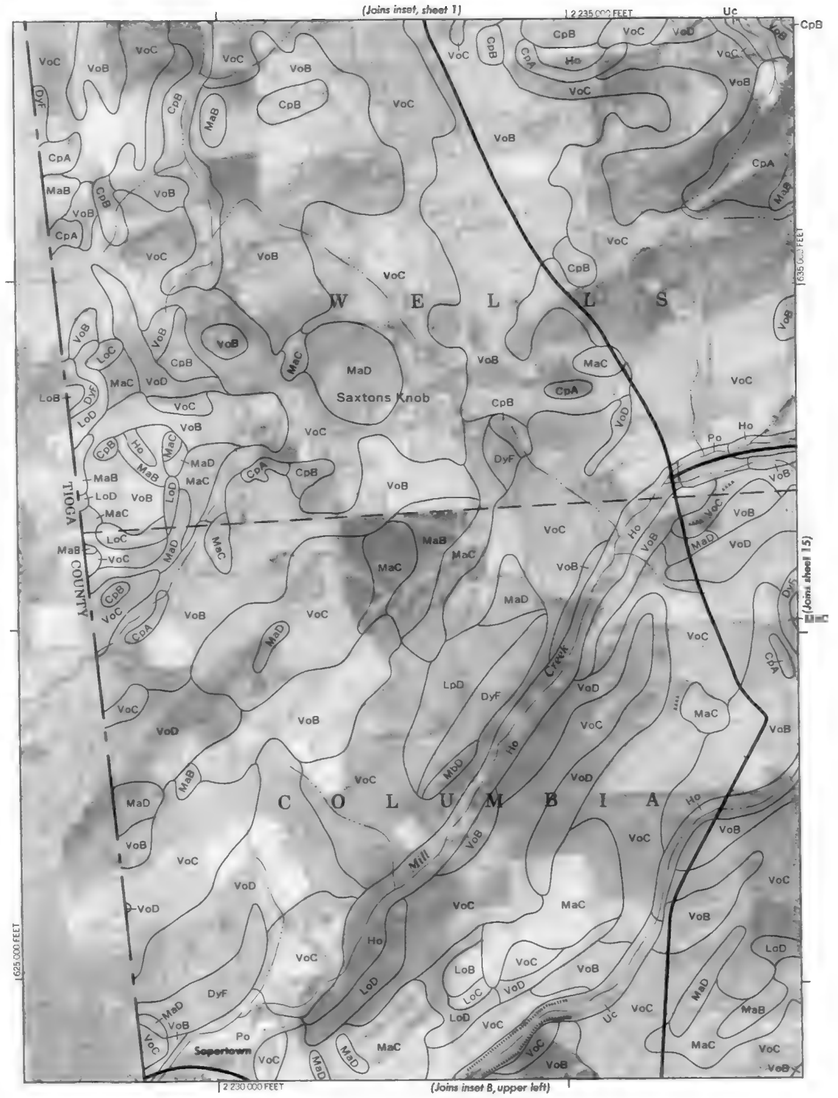
SCALE 1:20 000


2 410 000 FEET
(Joins sheet 7)
655 000 FEET
(Joins sheet 12)
(Joins sheet 20)
2 440 000 FEET
645 000 FEET
W A R R E N
O R W E L L
BUSQUEHANNA COUNTY
West Warren
Warren Center
Creek
Run
Lake of Meadows
water
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000
13
N

14

N

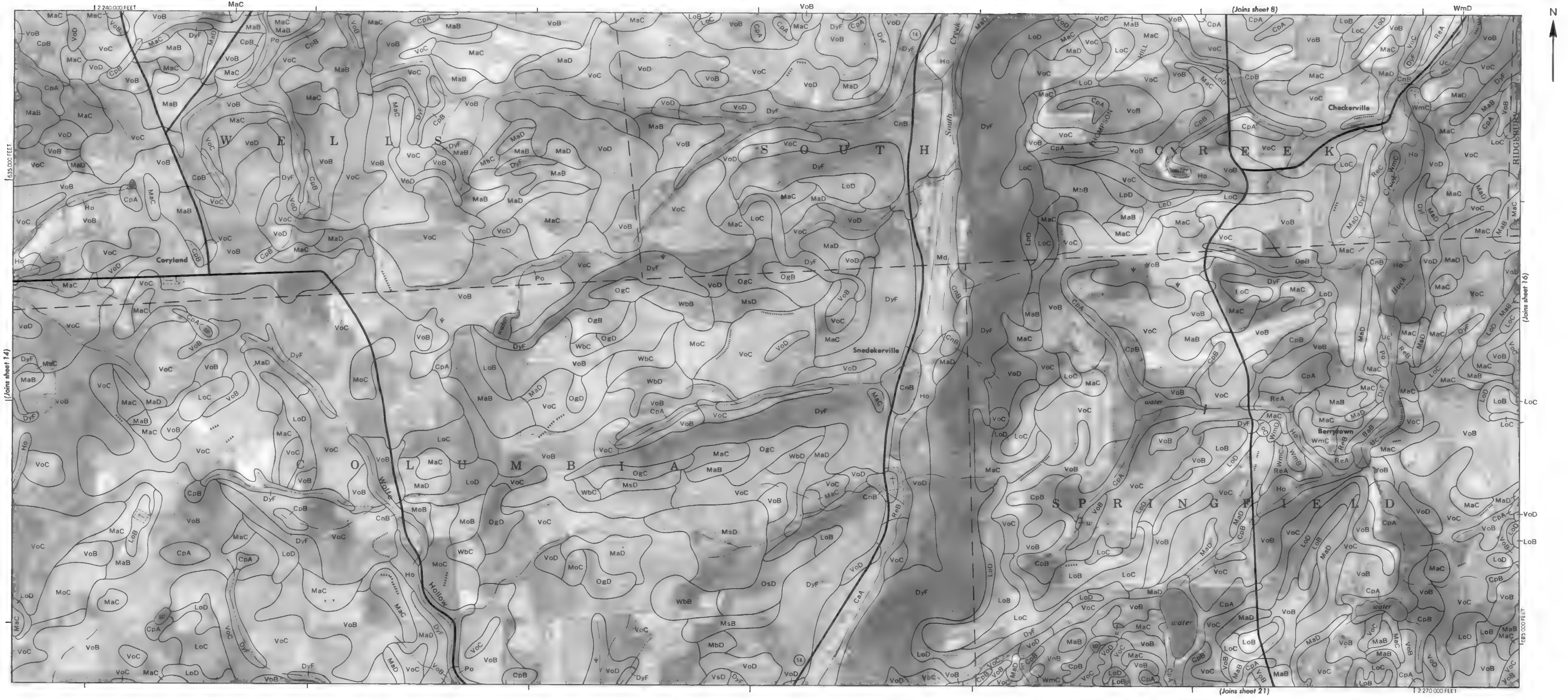




1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000



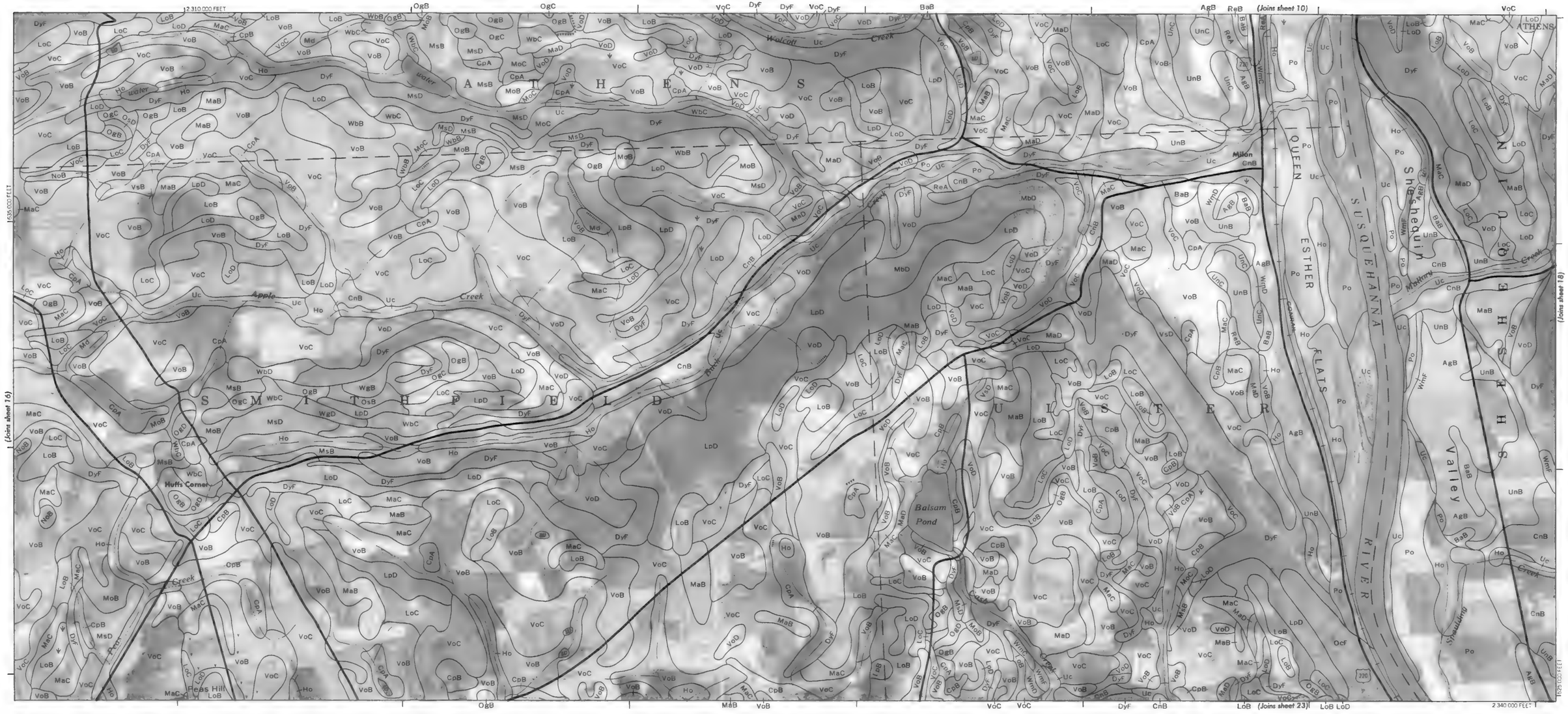
1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000


N
(Joins sheet 9)
(Joins sheet 15)
(Joins sheet 17)
(Joins sheet 22)
R I D G E B U R Y
S P R I N G F I E L D
S M I T H F I E L D
ATHENS
Stacey Pond
Miller Pond
Butler Hill
Lake Ondawa
Big Pond
Blakeslee Pond
Bird Pond
water
2 305 000 FEET
635 000 FEET
625 000 FEET
2 275 000 FEET
1 MILE
1 KILOMETER
SCALE 1:20 000

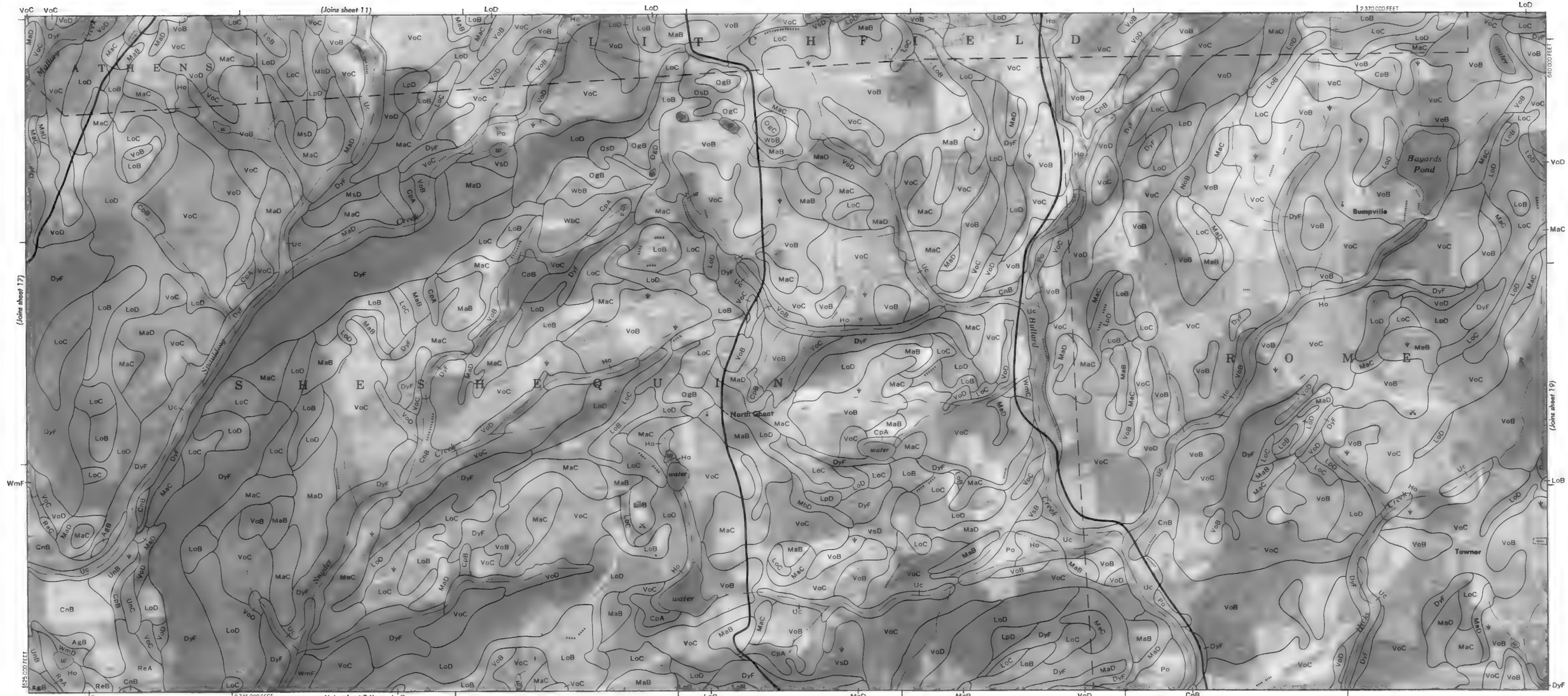
N



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

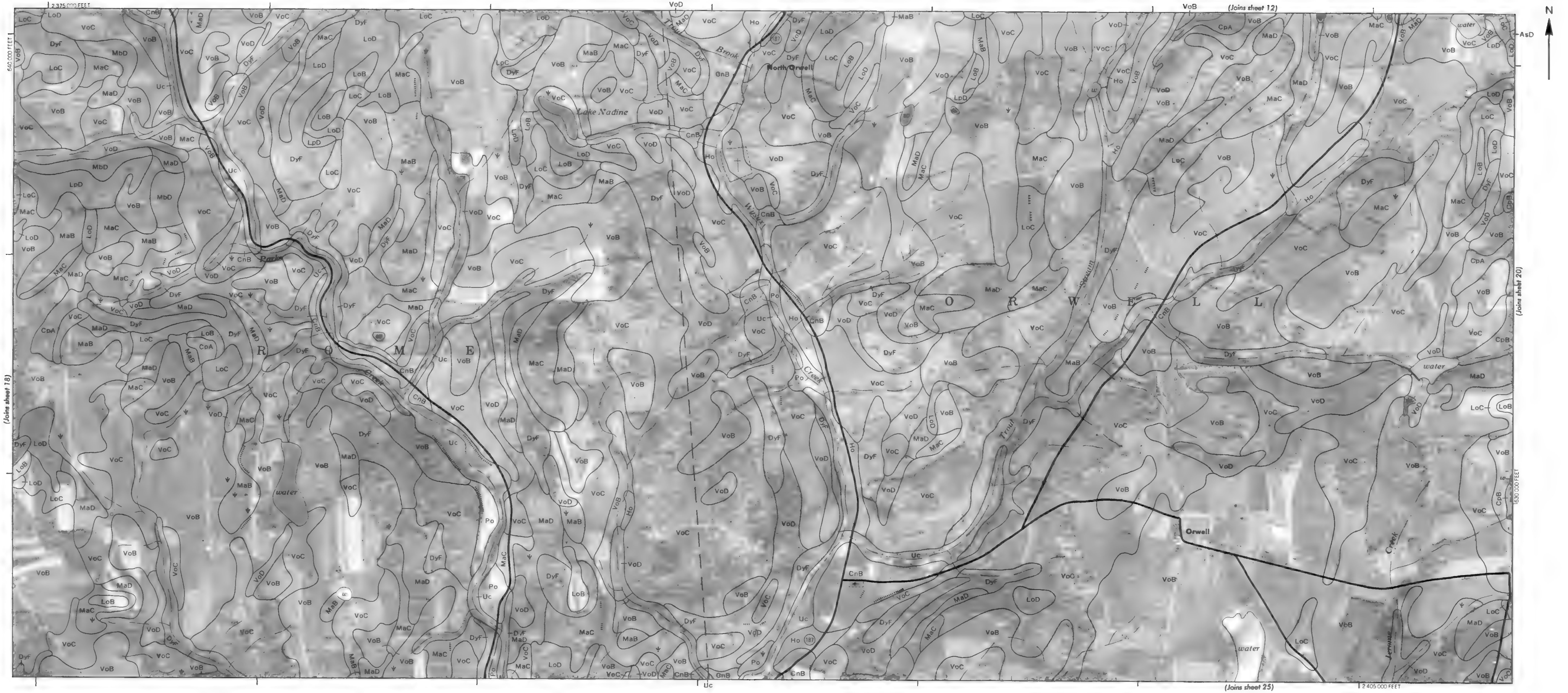
SCALE 1:20 000



1 3/4 1/2 1/4 0 1 MILE

0 5 0 1 KILOMETER

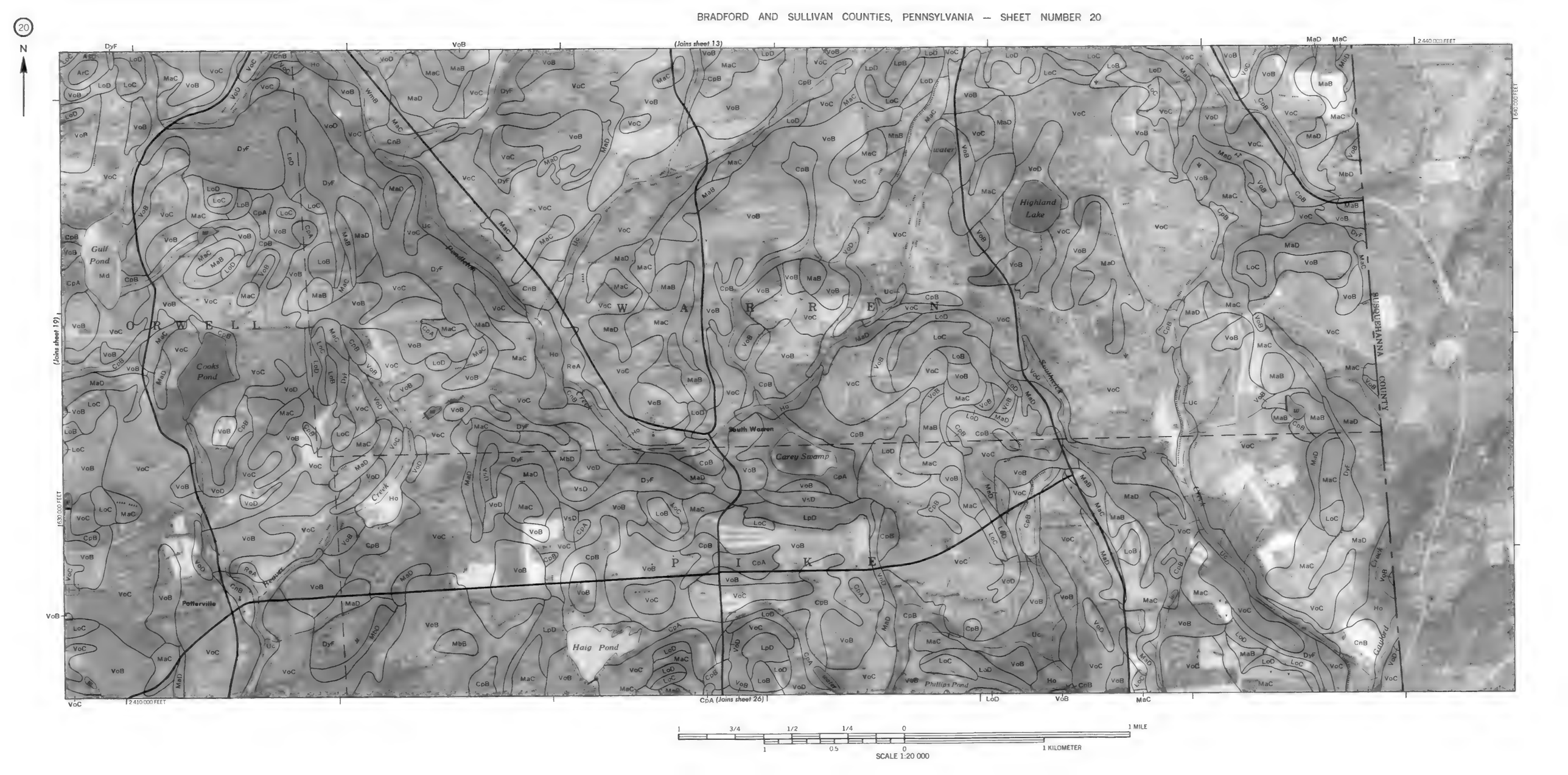
SCALE 1:20 000

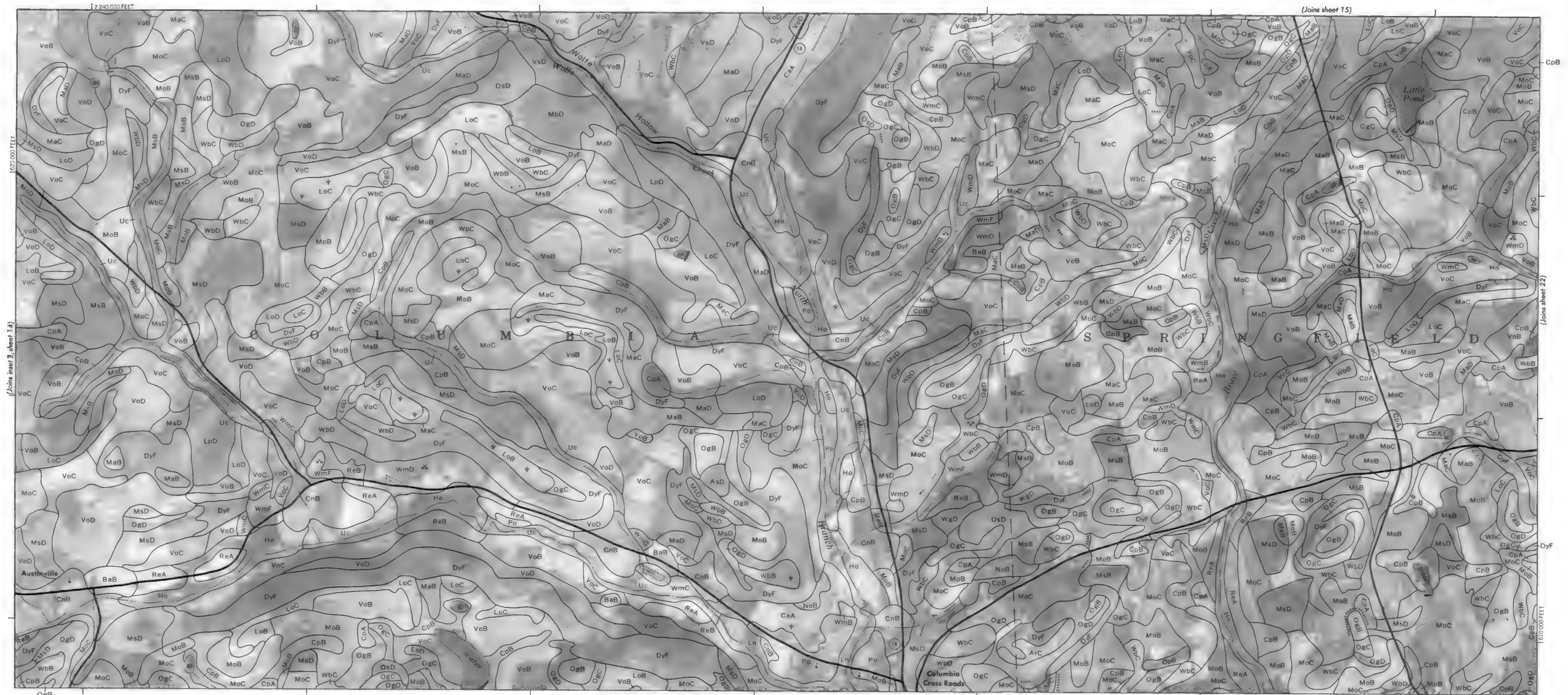


1 3/4 1/2 1/4 0 1 MILE

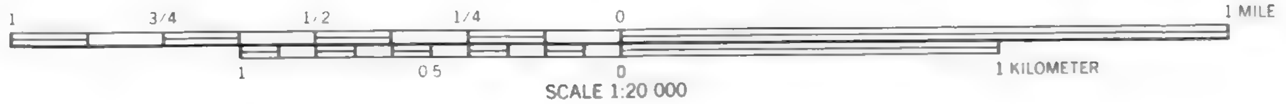
1 0.5 0 1 KILOMETER

SCALE 1:20 000


20
N
(Joins sheet 13)
(Joins sheet 19)
(Joins sheet 26)
2 440 000 FEET
2 410 000 FEET
640 000 FEET
630 000 FEET
O R W E L L
W A R R E N
P I K E
SUSQUEHANNA COUNTY
Gulf Pond
Cooks Pond
Highland Lake
Carey Swamp
Haig Pond
Phillips Pond
Potterville
South Warren
Pendleton Creek
Freeze Creek
Susquehanna
Gaylord Creek
1 MILE
3/4
1/2
1/4
0
1 KILOMETER
0.5
SCALE 1:20 000


2 240 000 FEET
620 000 FEET
(Joins sheet 15)
(Joins sheet 14)
(Joins sheet 22)
(Joins sheet 27)
2 270 000 FEET
660 000 FEET
N
COLUMBIA
SPRINGFIELD
Little Pond
Wolfe Hollow Creek
Mill Creek
Wyalusing Creek
Austinville
Columbia Cross Roads
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000


N
(Joins sheet 16)
(Joins sheet 21)
(Joins sheet 23)
(Joins sheet 28)
S P R I N G F I E L D
S M I T H F I E L D
Springfield
Harkness
Ayers Crossroads
East Smithfield
Mill
Leonard
Creek
Branch
water

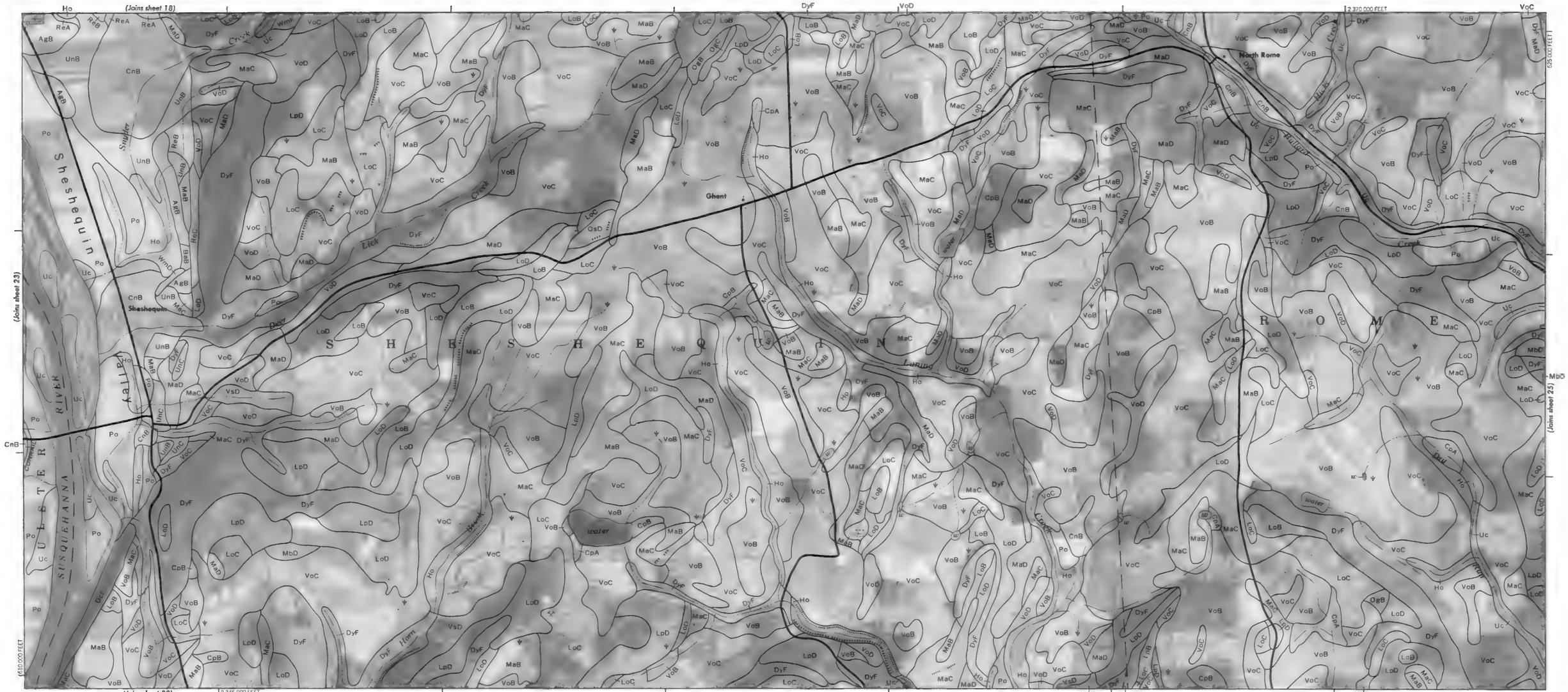

1
3/4
1/2
1/4
0
1 MILE
1
0.5
0
1 KILOMETER
SCALE 1:20 000

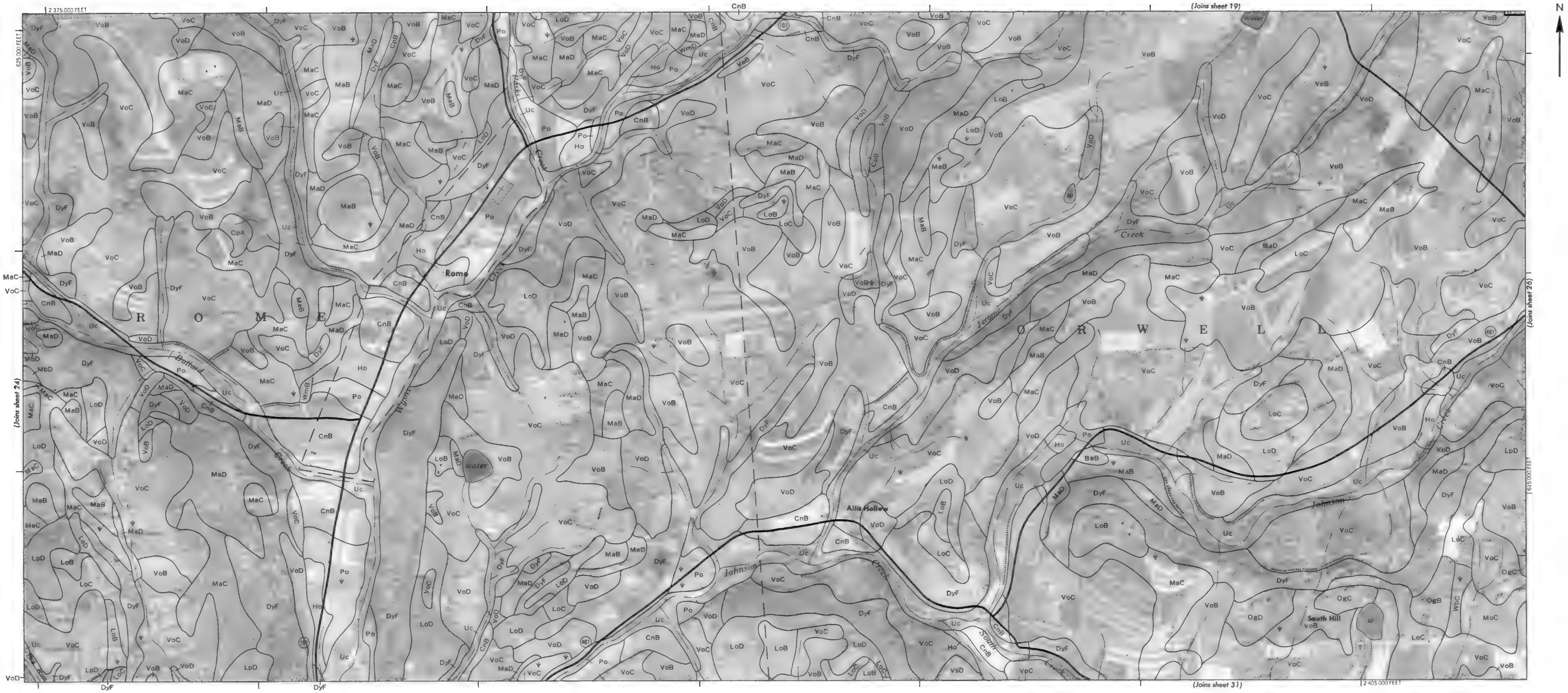
1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

BRADFORD AND SULLIVAN COUNTIES, PENNSYLVANIA — SHEET NUMBER 24



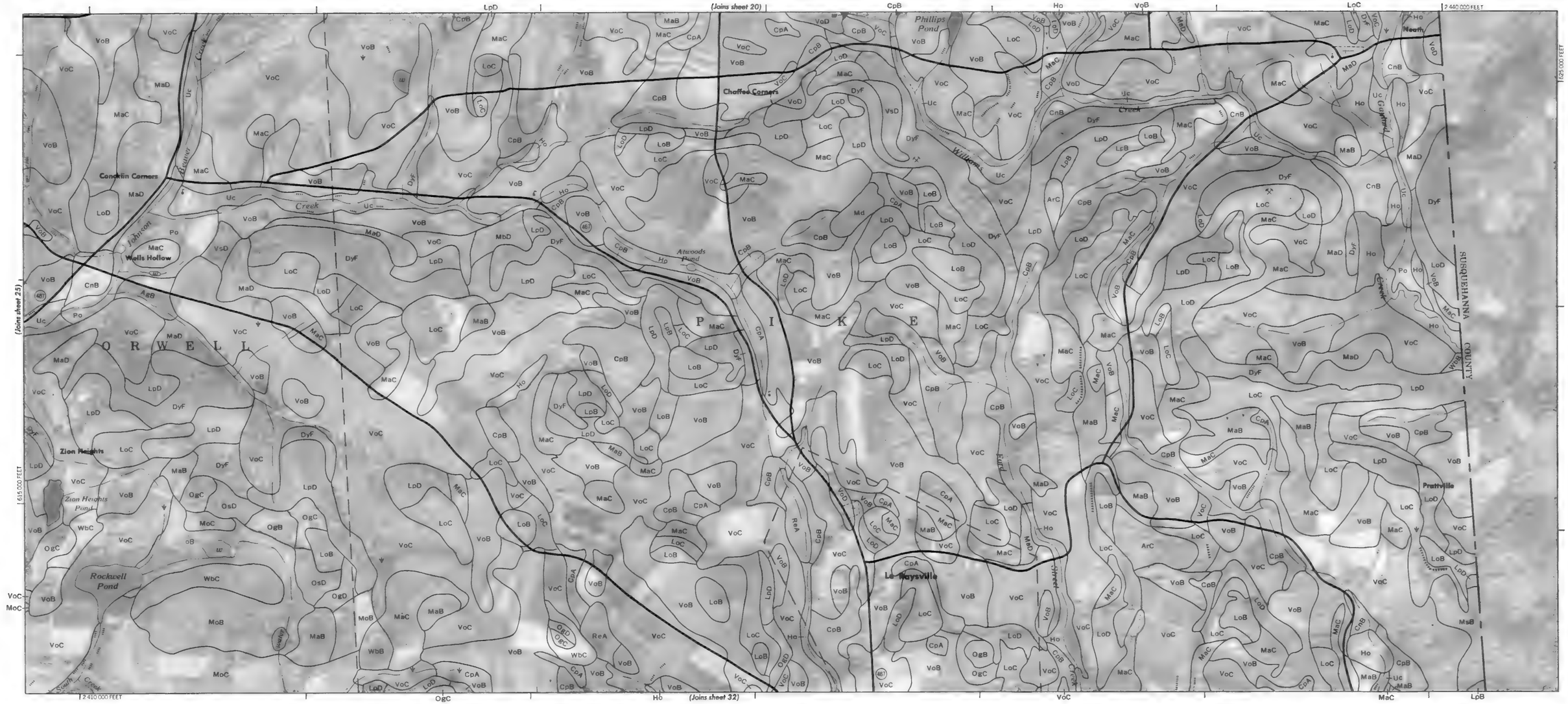


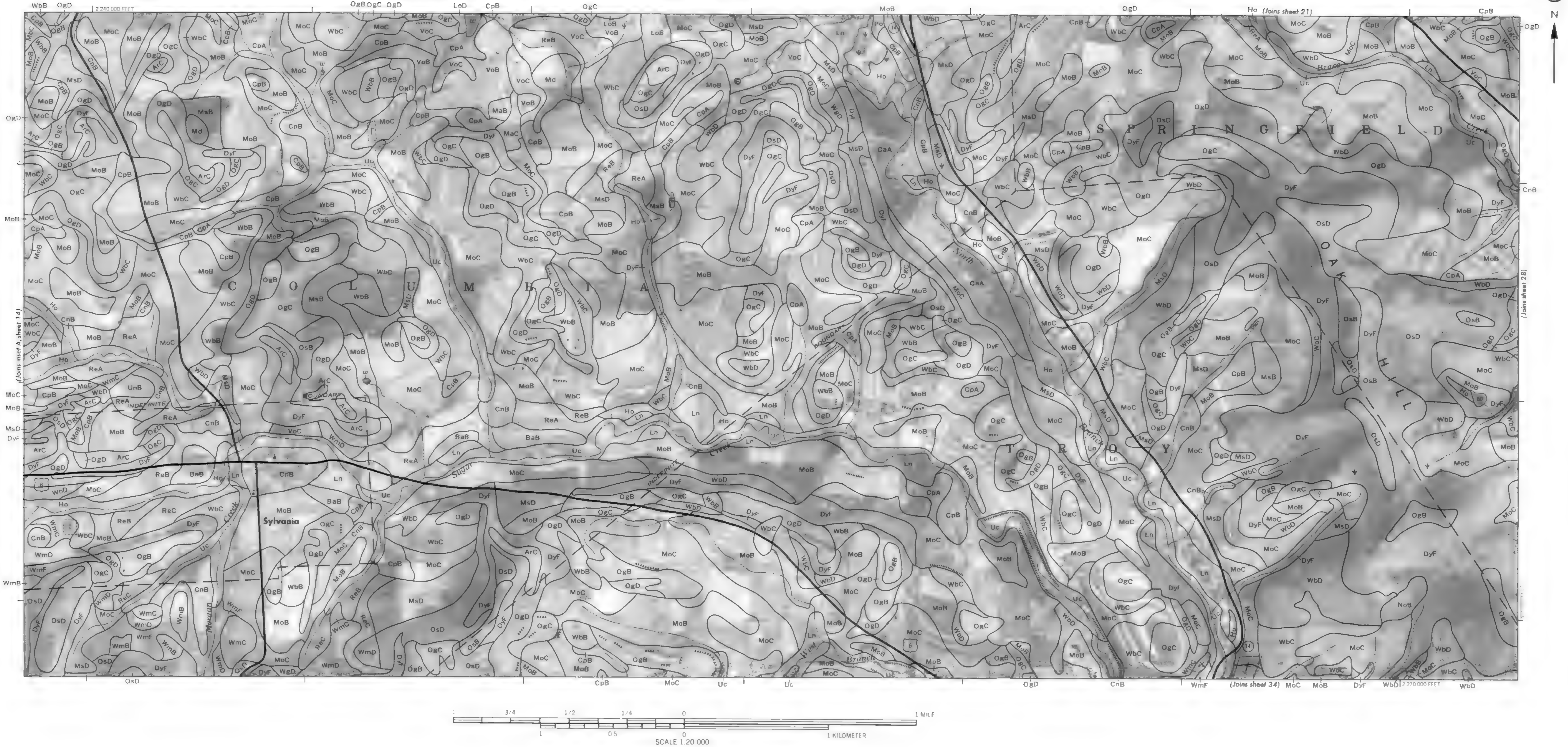
1 3/4 1/2 1/4 0 1 MILE

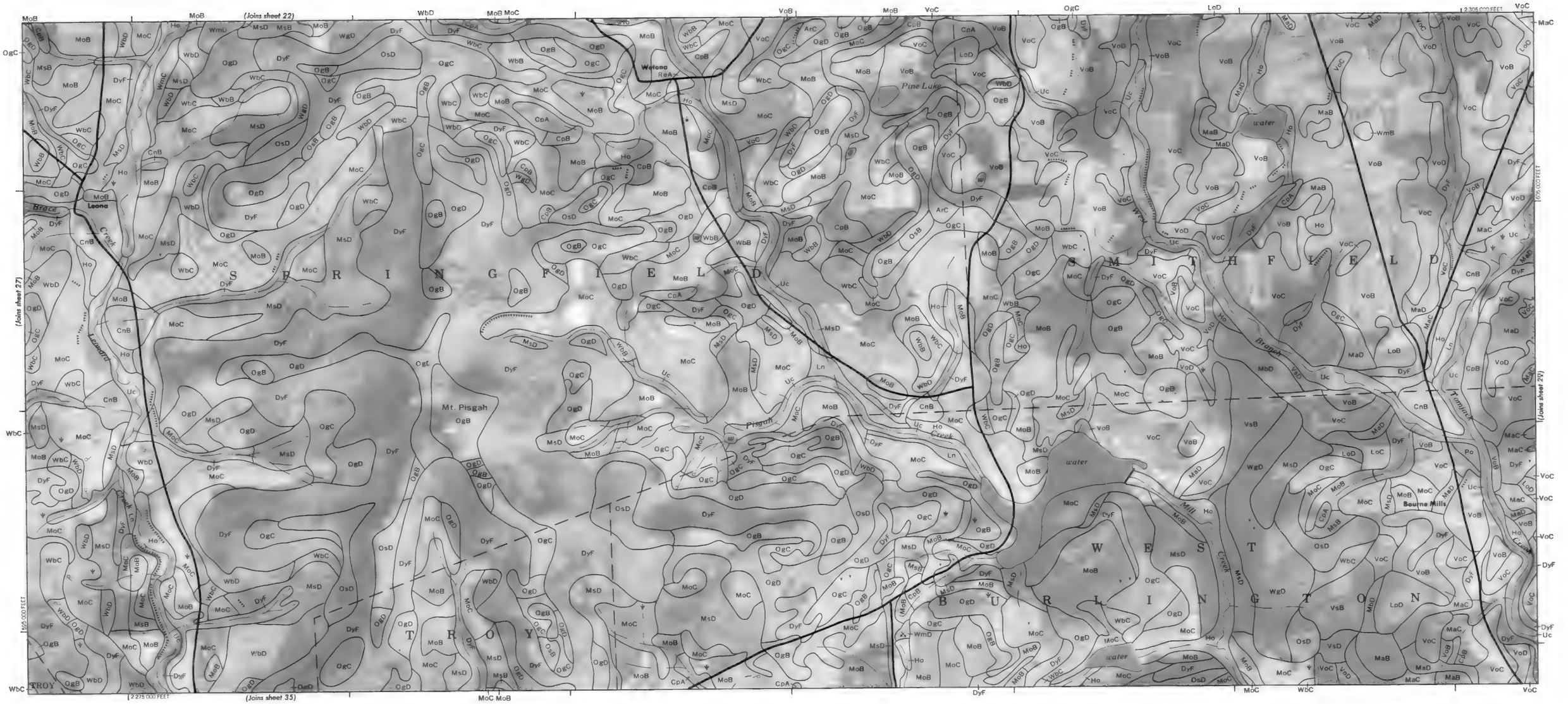
1 0.5 0 1 KILOMETER

SCALE 1:20 000

BRADFORD AND SULLIVAN COUNTIES, PENNSYLVANIA — SHEET NUMBER 26




N
(Joins sheet 21)
(Joins sheet 28)
(Joins sheet 34)
(Joins inset A, sheet 14)
2 240 000 FEET
2 270 000 FEET
C O L U M B I A
S P R I N G F I E L D
T R O Y
O A K H I L L
Sylvania
Sugar Creek
North Branch
West Branch
Morgan Creek
Brace Creek
INDEFINITE BOUNDARY
3/4
1/2
1/4
0
1 MILE
1
0.5
0
1 KILOMETER
SCALE 1:20 000



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

BRADFORD AND SULLIVAN COUNTIES, PENNSYLVANIA — SHEET NUMBER 29

1 3/4 1/2 1/4 0 1 MILE

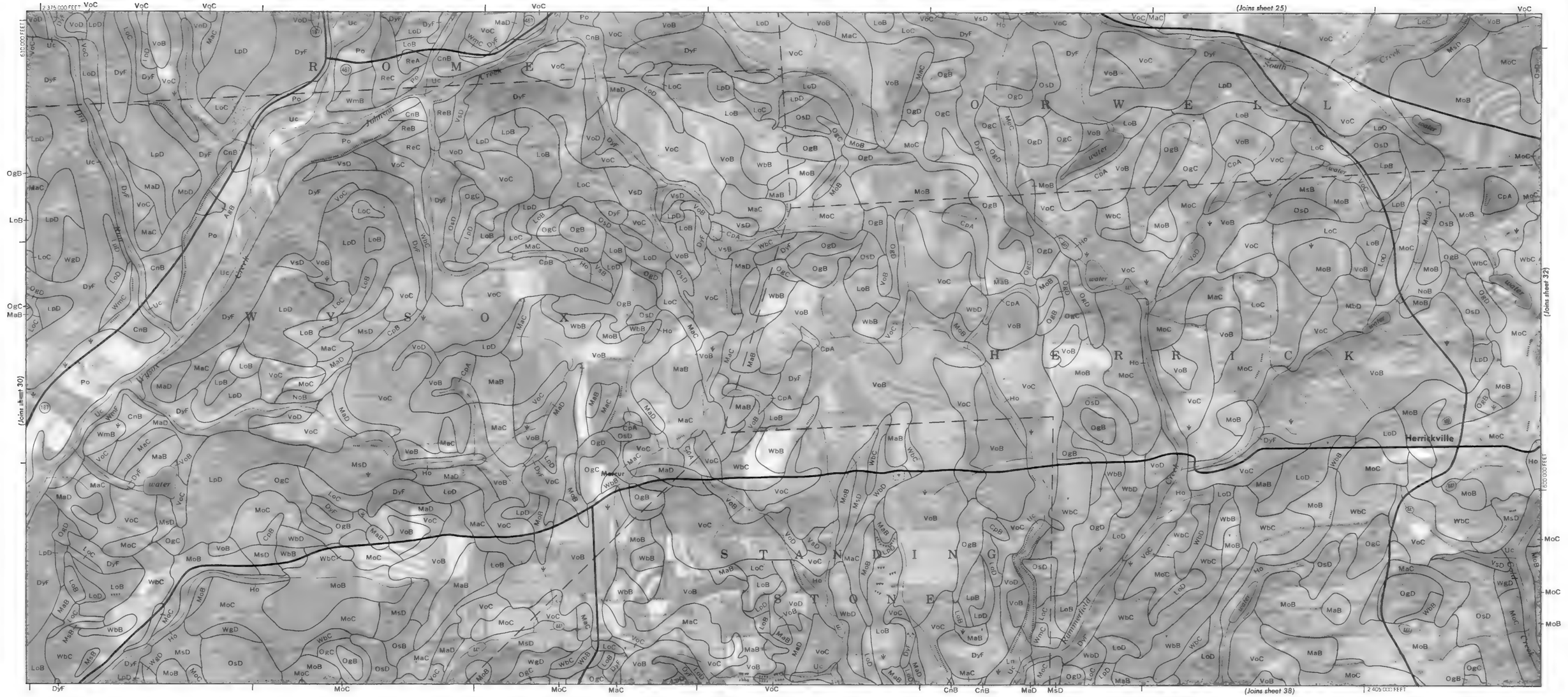
1 0.5 0 1 KILOMETER

SCALE 1:20 000

29

N


30
N
(Joins sheet 24)
(Joins sheet 29)
(Joins sheet 31)
(Joins sheet 37)
S H E S H E Q U I N
N O R T H T O W A N D A
R O M E
W Y S O X
ULSTER
SUSQUEHANNA RIVER
Hornbrook
Horn Brook
Black
Blacks Lake
Quarry Glen
Bald Eagle Island
SUGAR CREEK
North Towanda
Hemlock Run
Wesauking Lake
Shores Pond
Laning Creek
Myersburg
Hollow Run
Pond Hill Run
water
CONRAIL
2 345 000 FEET
2 370 000 FEET
1 MILE
1 KILOMETER
SCALE 1:20 000

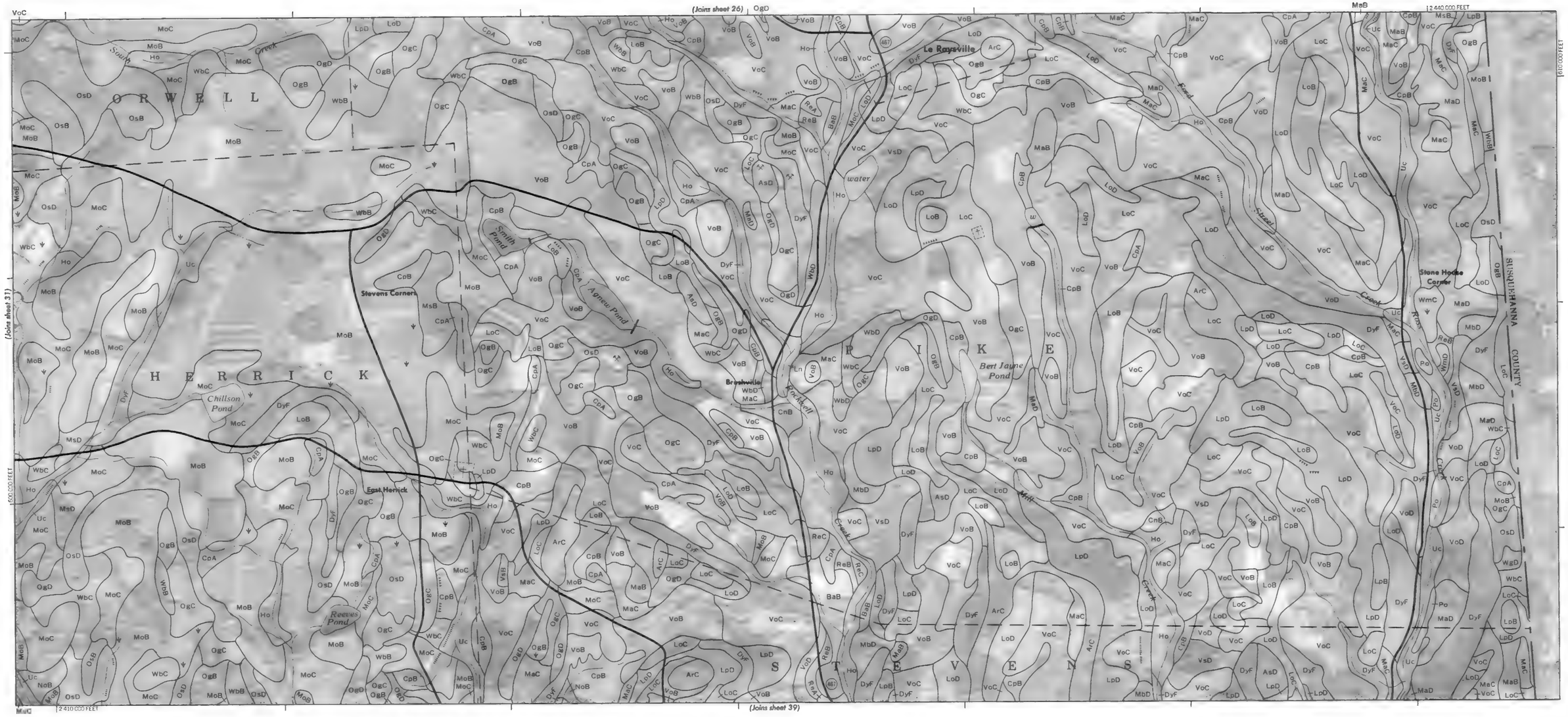


1 3/4 1/2 1/4 0 1 MILE

1 0 5 0 1 KILOMETER

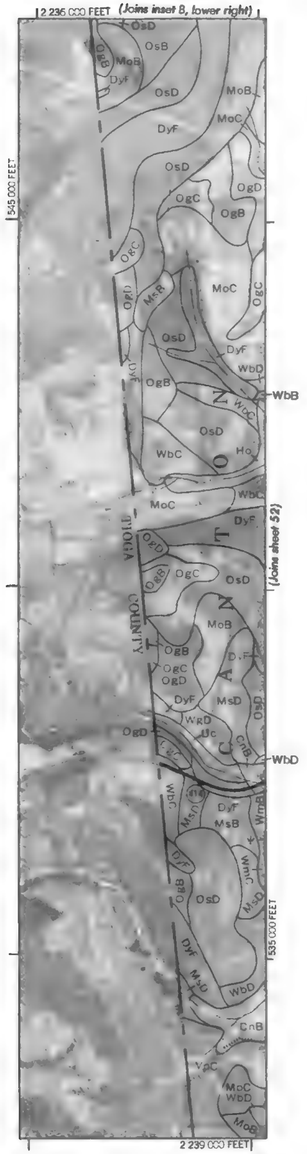
SCALE 1:20 000

BRADFORD AND SULLIVAN COUNTIES, PENNSYLVANIA — SHEET NUMBER 32



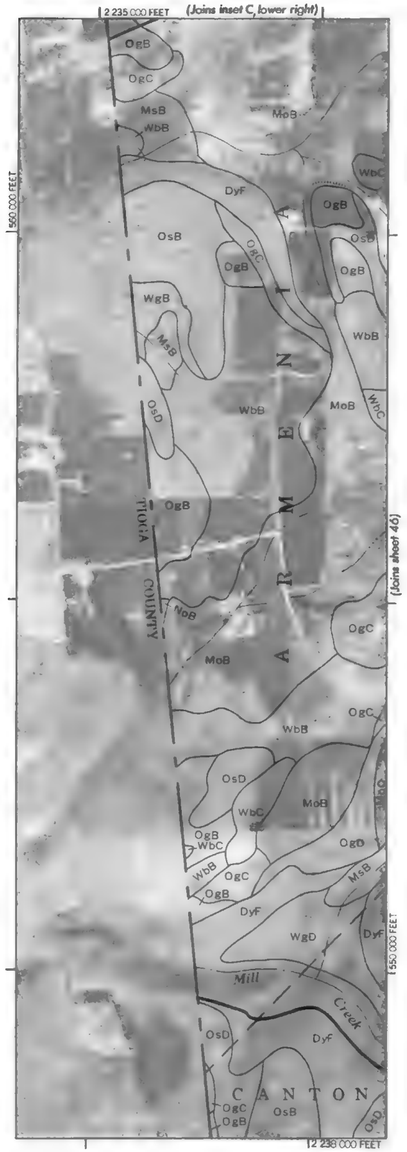
N

INSET A



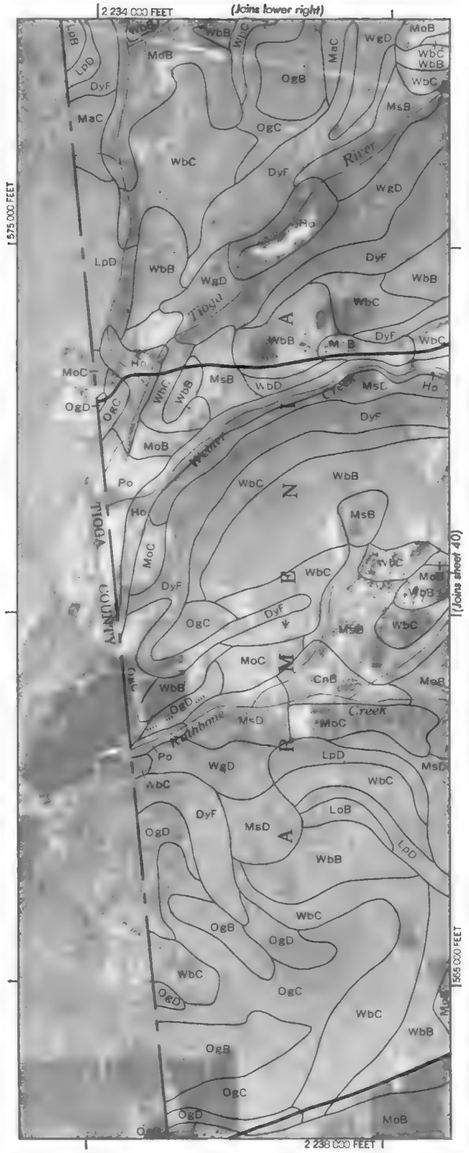
3000 AND 5000-FOOT GRID TICKS

INSET B

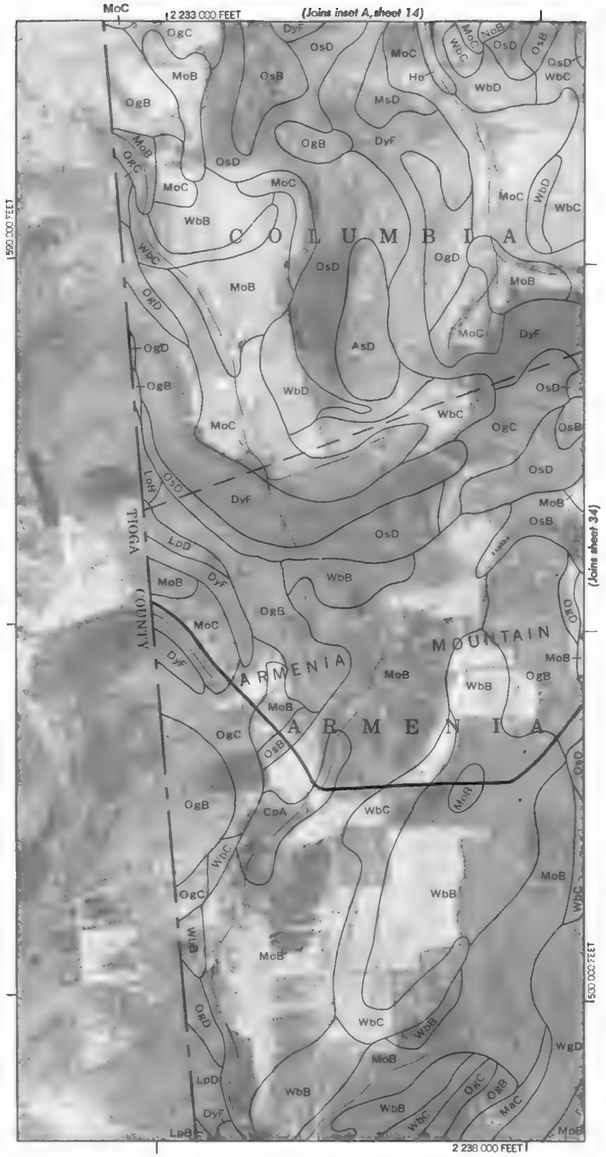


3000 AND 5000-FOOT GRID TICKS

INSET C



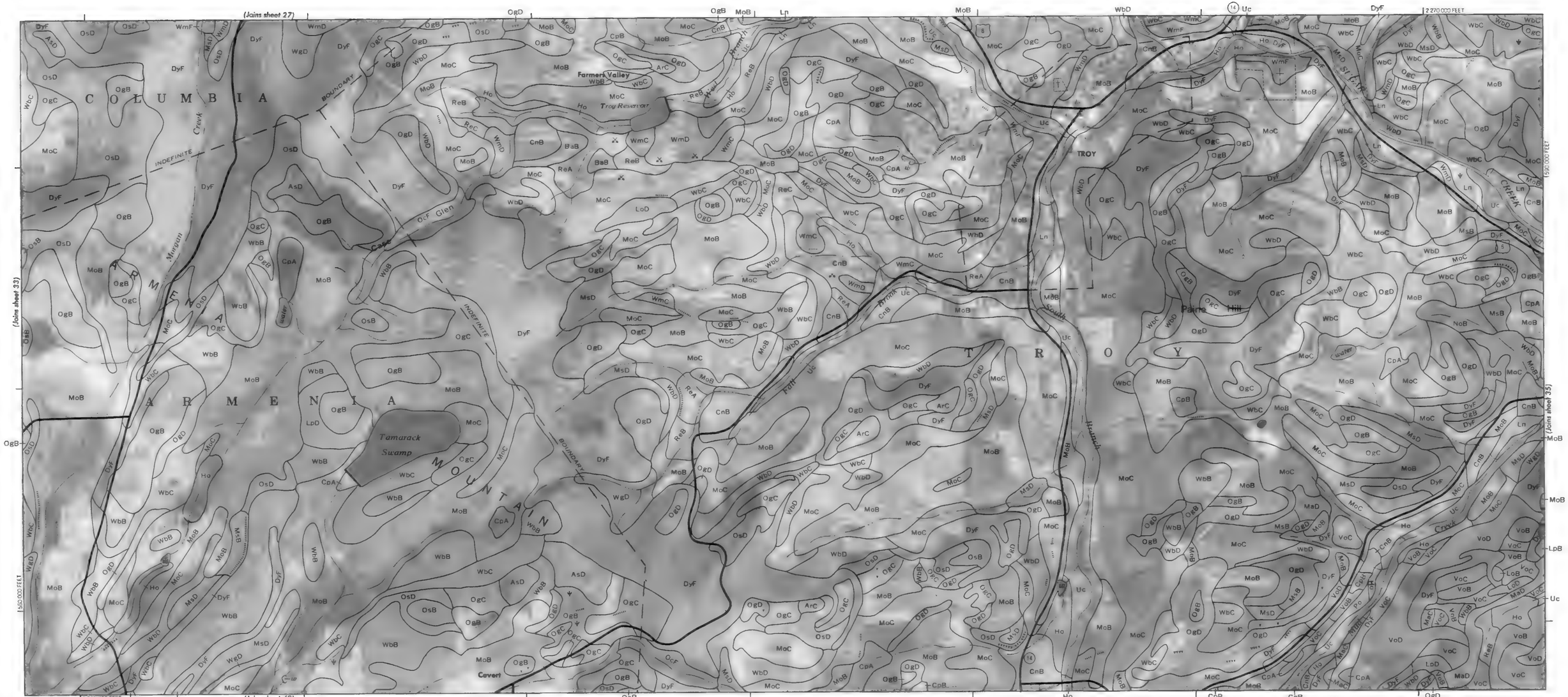
4000 AND 5000-FOOT GRID TICKS



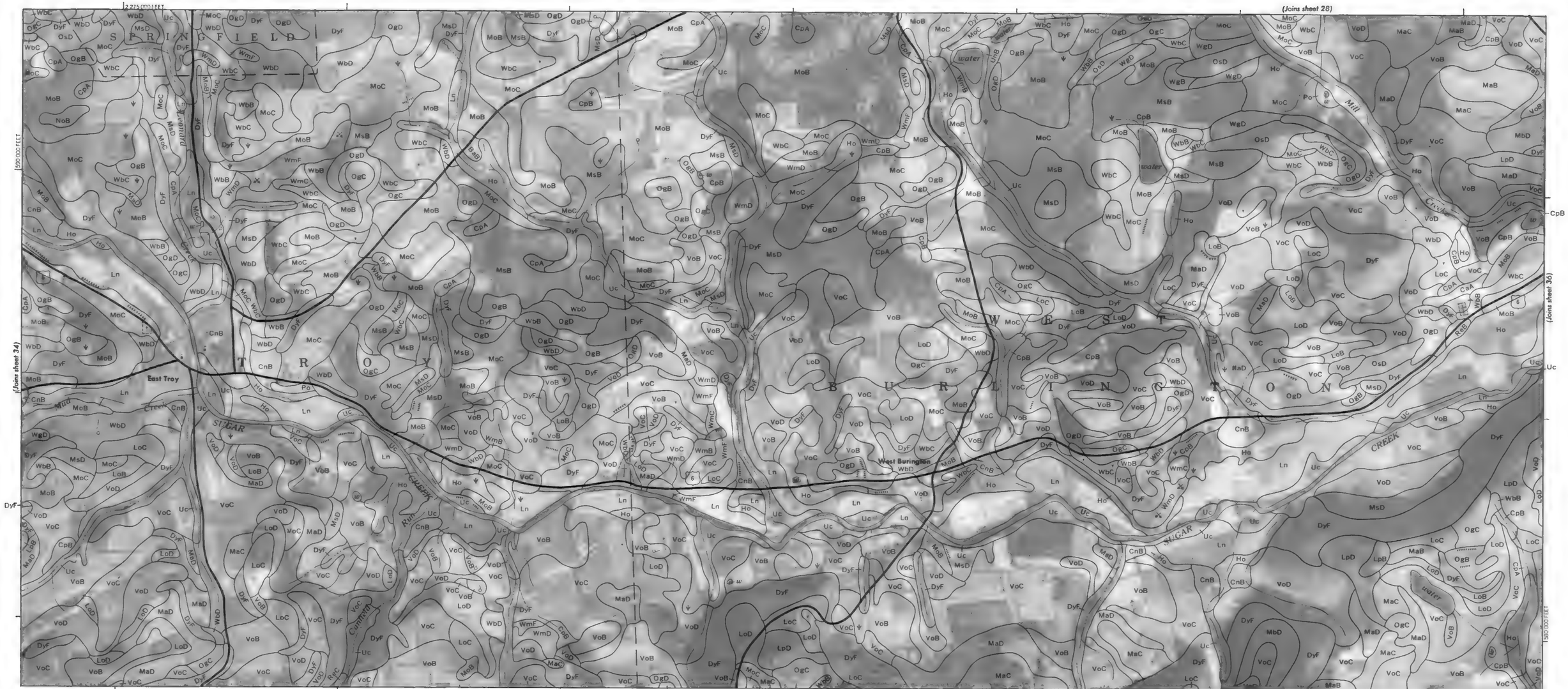
1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

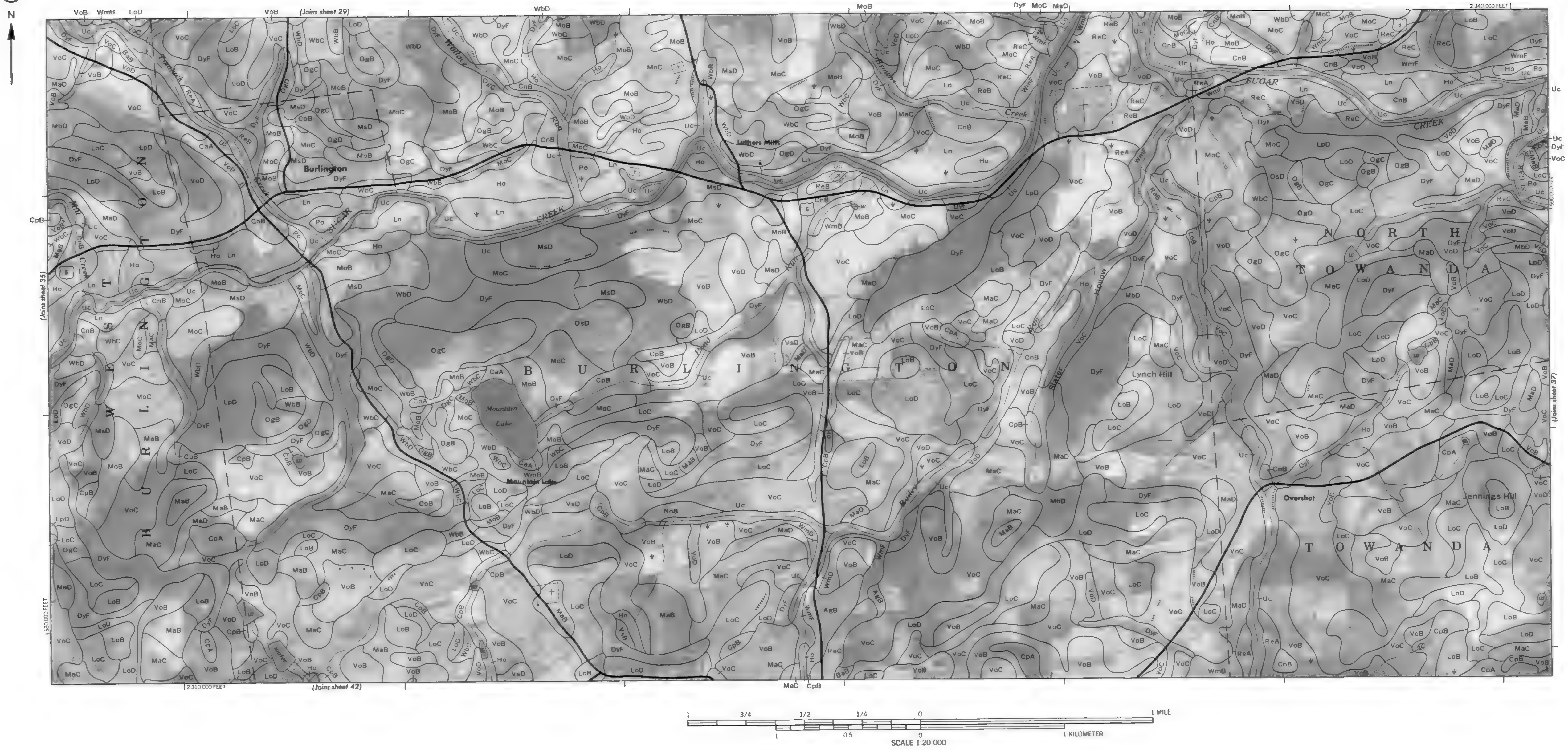
SCALE 1:20 000


34
N
(Joins sheet 27)
(Joins sheet 33)
(Joins sheet 35)
(Joins sheet 40)
2 270 000 FEET
2 240 000 FEET
592 000 FEET
550 000 FEET
COLUMBIA
ARMENIA
MOUNTAIN
TROY
BOUNDARY
INDEFINITE
Tamarack Swamp
Farmers Valley
Troy Reservoir
Parris Hill
South Brook
Fall Brook
Hemlock Creek
Cole Glen
Covert
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

BRADFORD AND SULLIVAN COUNTIES, PENNSYLVANIA — SHEET NUMBER 35



35


N
(Joins sheet 29)
(Joins sheet 35)
(Joins sheet 37)
(Joins sheet 42)
Burlington
Luthers Mills
Mountain Lake
Lynch Hill
Overshot
Jennings Hill
BURLINGTON
WEST BURLINGTON
NORTH TOWANDA
TOWANDA
SUGAR CREEK
Mountain Lake
Slater Hollow
Bailey Run
Dead Run
Wallace Run
Browns Creek
Mill Creek
2 340 000 FEET
2 310 000 FEET
580 000 FEET
1 MILE
1 KILOMETER
SCALE 1:20 000

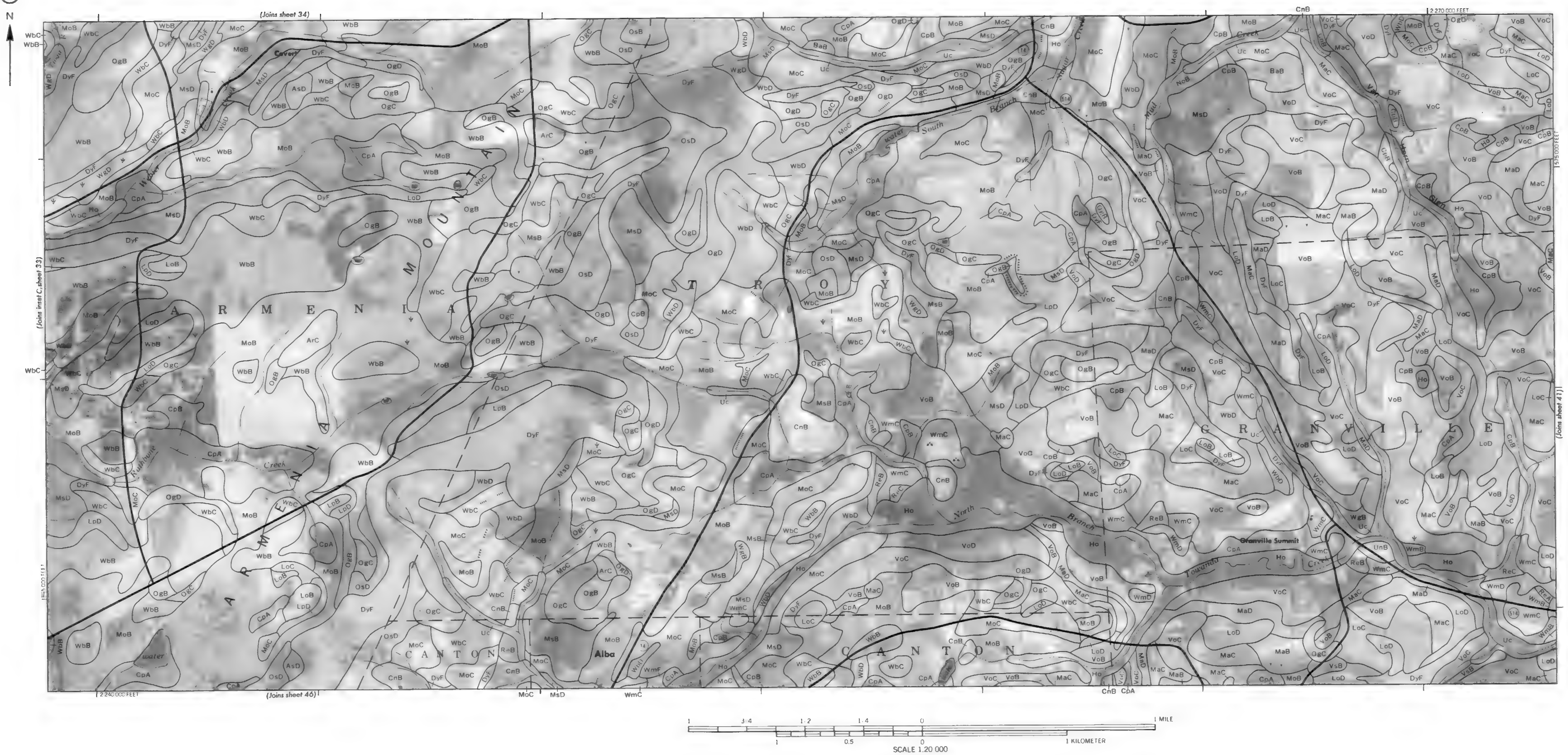
SCALE 1:20 000

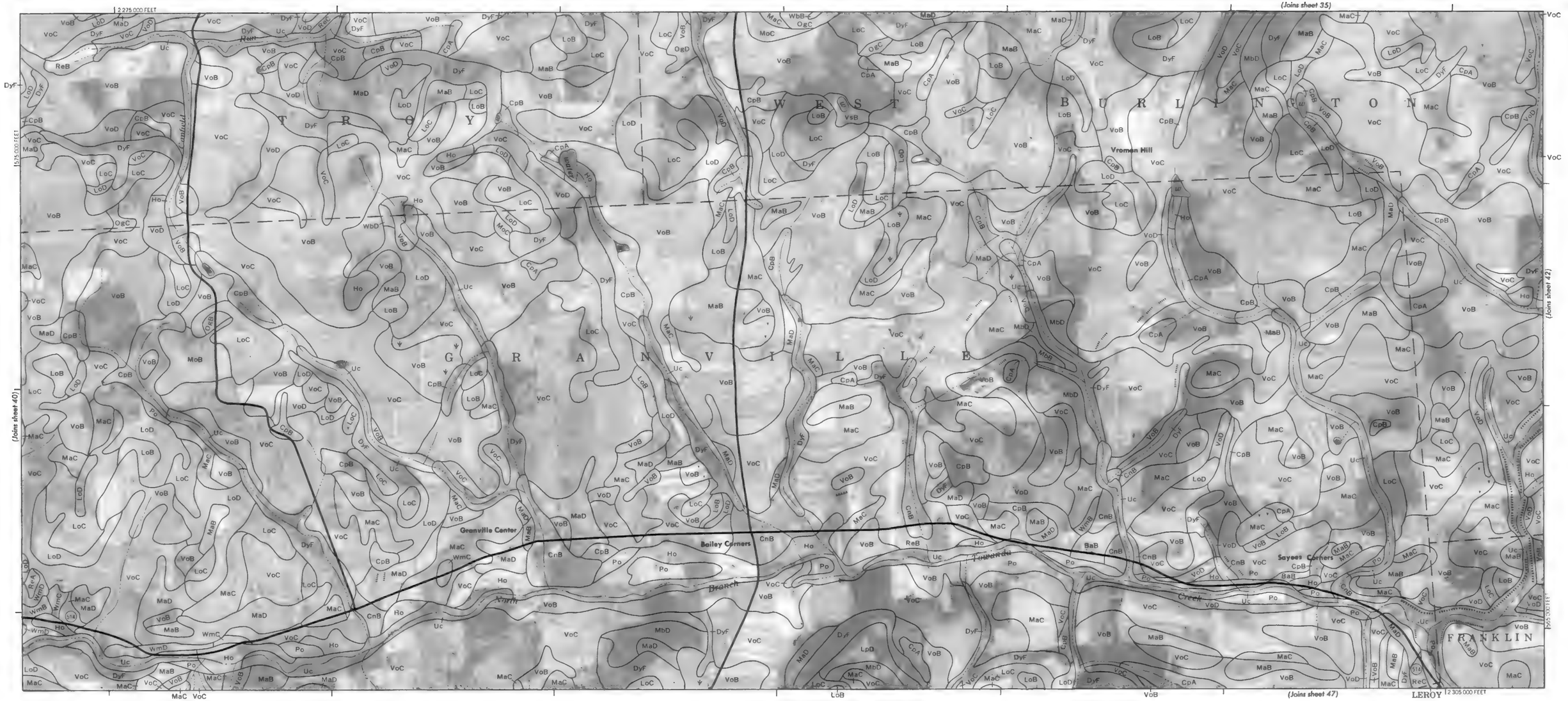
1 MILE

1 KILOMETER

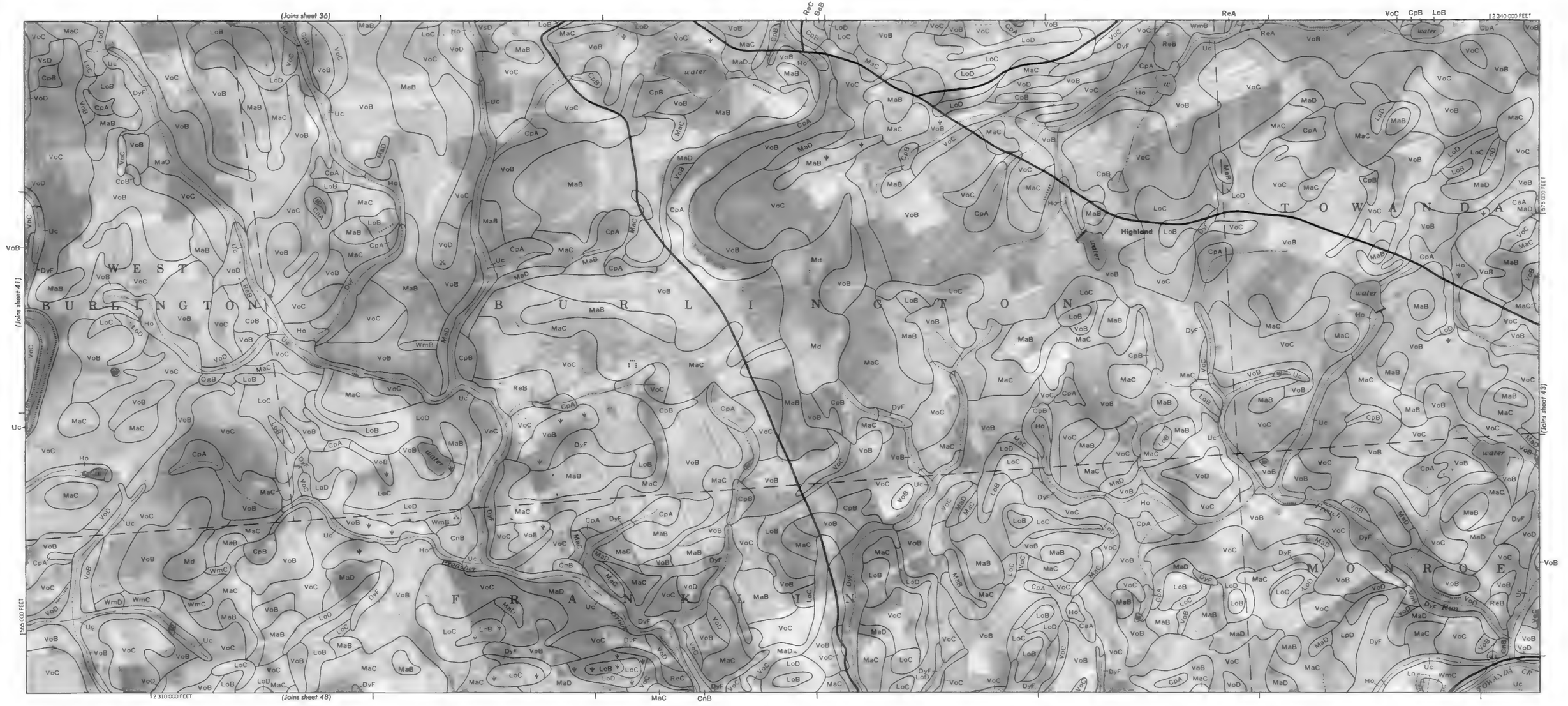
BRADFORD AND SULLIVAN COUNTIES, PENNSYLVANIA — SHEET NUMBER 38

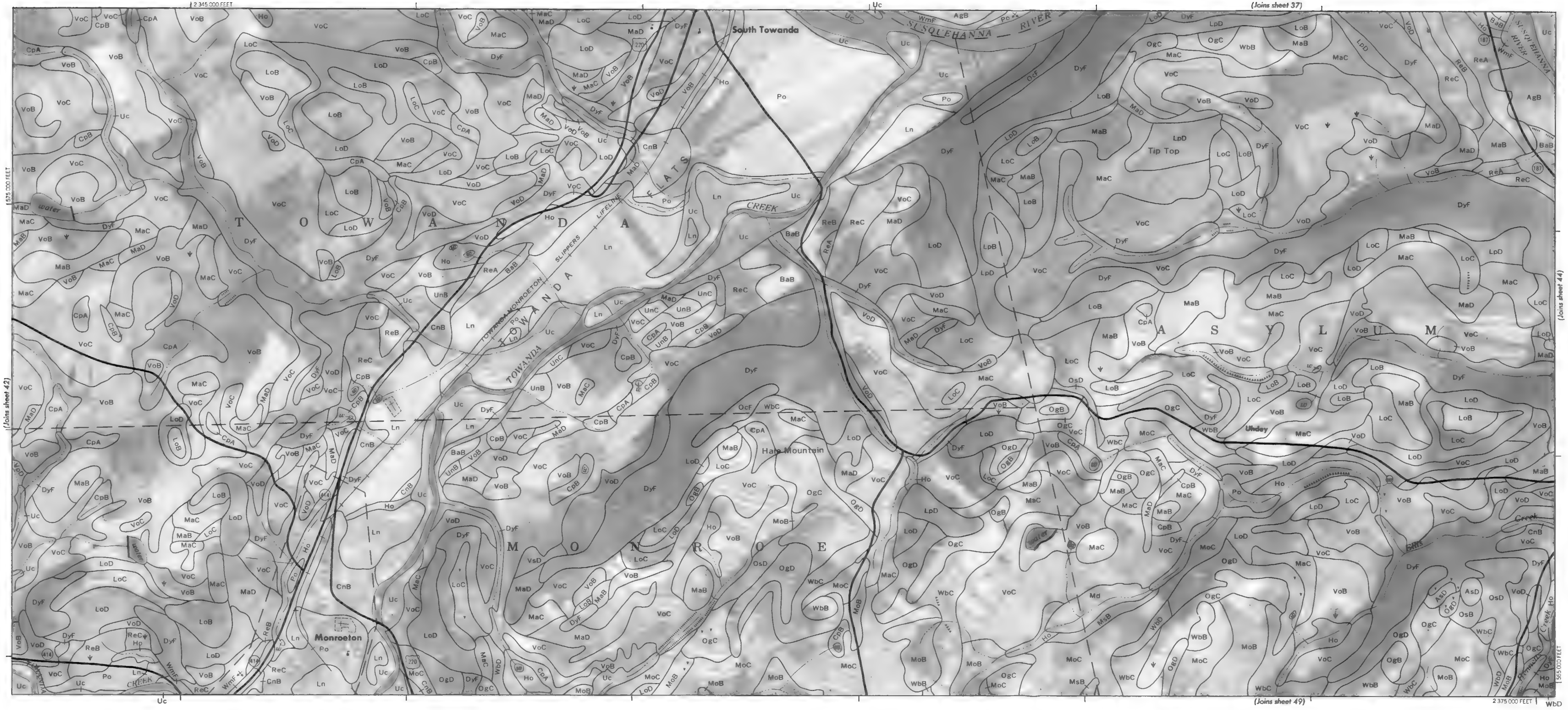

N
(Joins sheet 32)
(Joins sheet 38)
(Joins sheet 45)
(inset C, sh 63)
2 410 000 FEET
2 440 000 FEET
595 000 FEET
565 000 FEET
H E R R I C K
S T E V E N S
SUSQUEHANNA COUNTY
Leisure Lakes
Totem Lake
Stevensville
WYALUSING
Cold
Creek
Rockwell
Mill Creek
Bennett Creek
Camp
1 MILE
1 KILOMETER
SCALE 1:20 000


40
N
(Joins sheet 34)
(Joins sheet 46)
(Joins inset C, sheet 33)
(Joins sheet 41)
2 270 000 FEET
2 240 000 FEET
575 000 FEET
ARMENIA MOUNTAIN
ARMENIA
TROY
GRANVILLE
CANTON
Granville Summit
Alba
Covert
South Branch Sugar Creek
North Branch
Towanda Creek
Ruttsville Creek
Mud Creek
Van Horn Glen
SCALE 1:20 000
1 MILE
1 KILOMETER


2 275 000 FEET
(Joins sheet 35)
N
TROY
GRANVILLE
WEST BURLINGTON
Vroman Hill
Granville Center
Bailey Corners
Towanda Creek
Sayres Corners
FRANKLIN
LEROY
2 305 000 FEET
(Joins sheet 40)
(Joins sheet 42)
(Joins sheet 47)
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

BRADFORD AND SULLIVAN COUNTIES, PENNSYLVANIA — SHEET NUMBER 42





1 3/4 1/2 1/4 0 1 MILE

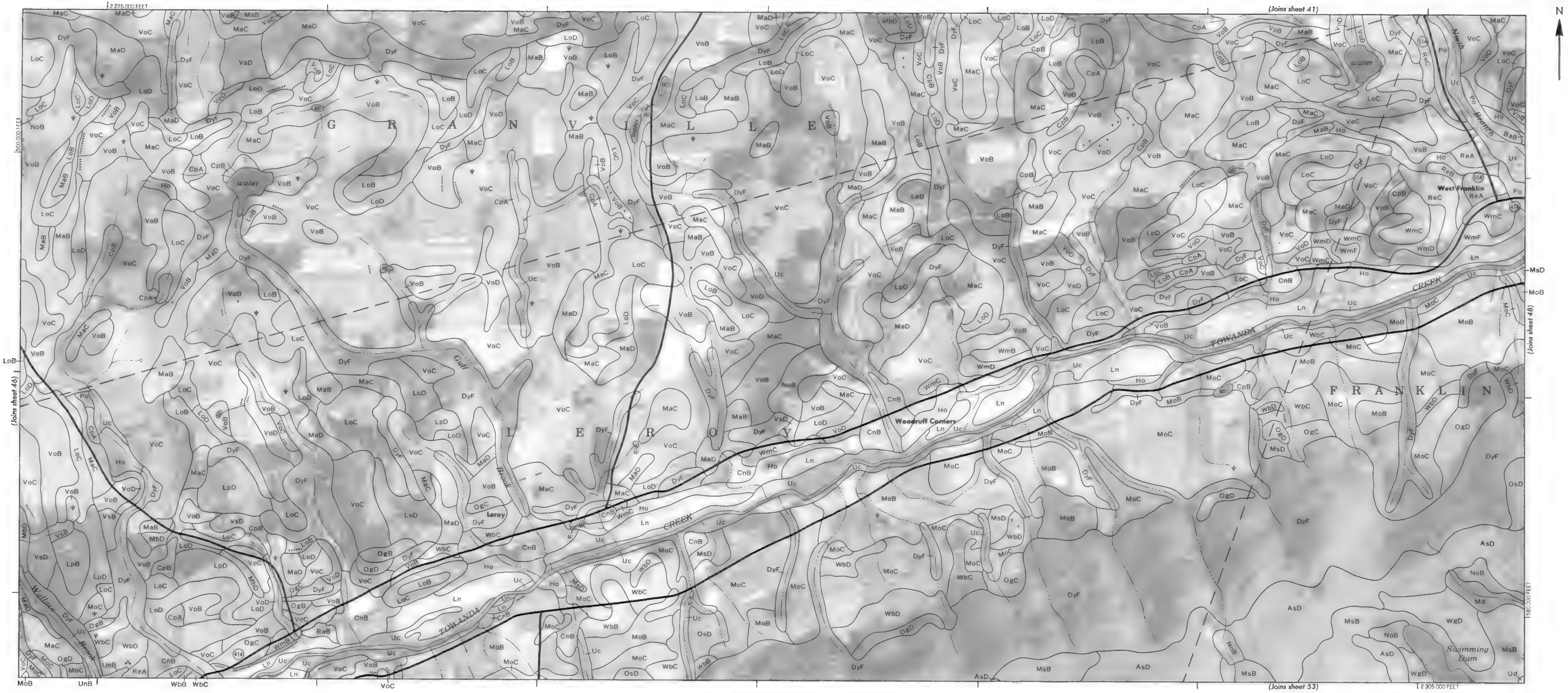
1 0.5 0 1 KILOMETER

SCALE 1:20 000

BRADFORD AND SULLIVAN COUNTIES, PENNSYLVANIA — SHEET NUMBER 44


45
N
2 410 000 FEET
560 000 FEET
570 000 FEET
2 440 000 FEET
(Joins sheet 39)
(Joins sheet 44)
(Joins sheet 51)
(Joins inset C, sheet 53)
H E R R I C K
S T E V E N S
T U S C A R O R A
W Y A L U S I N G
Camptown
Wyalusing Creek
Camp Creek
Cold Creek
Billings Creek
Bennett Creek
Long Swamp
Snyder Swamp
Huff Hill
Ackley Pond
Mill Creek
Beaver Meadow Swamp
Beaver Meadow Pond
Dug Road Creek
water
1 MILE
1 KILOMETER
SCALE 1:20 000

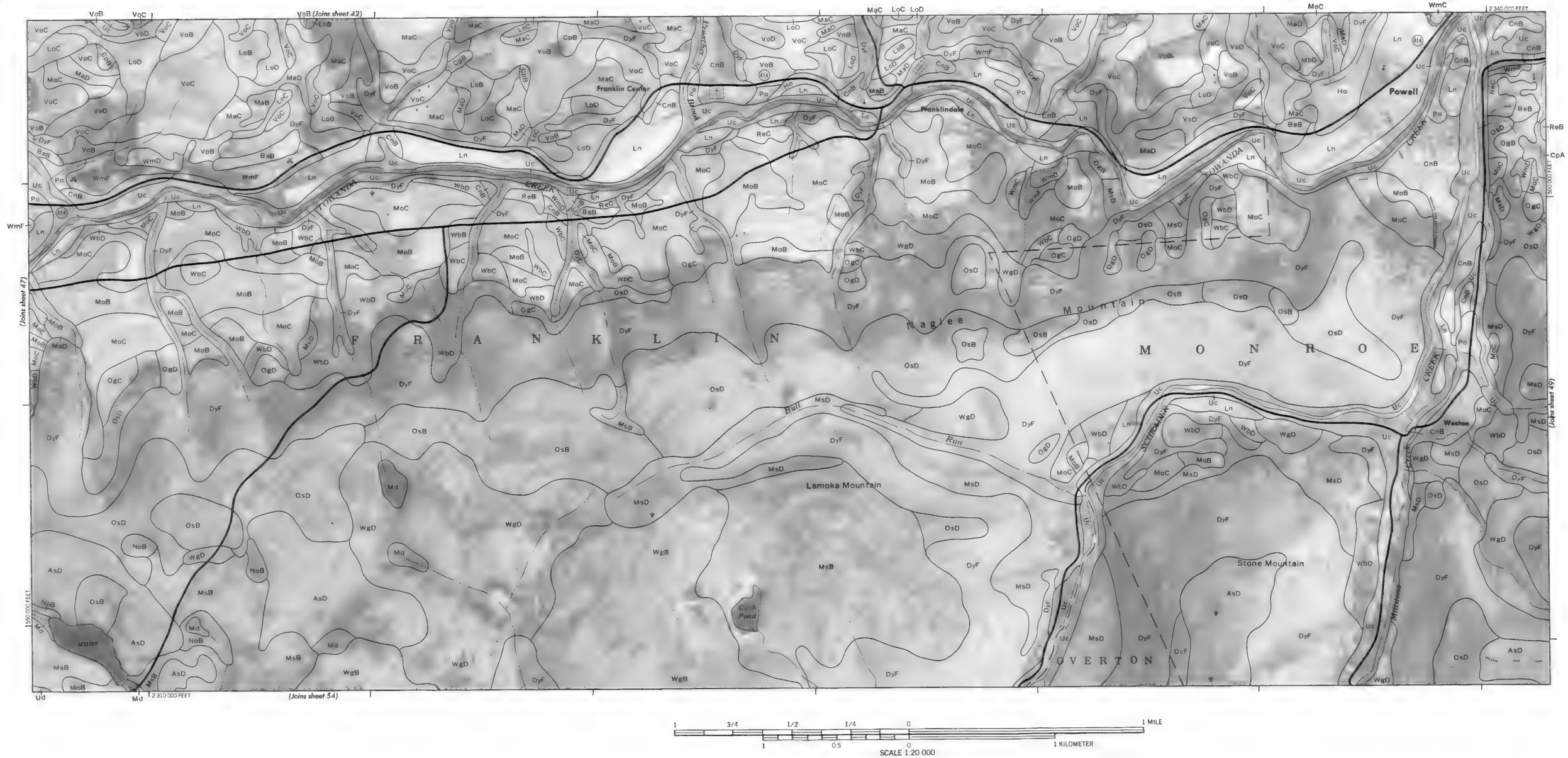
BRADFORD AND SULLIVAN COUNTIES, PENNSYLVANIA — SHEET NUMBER 46

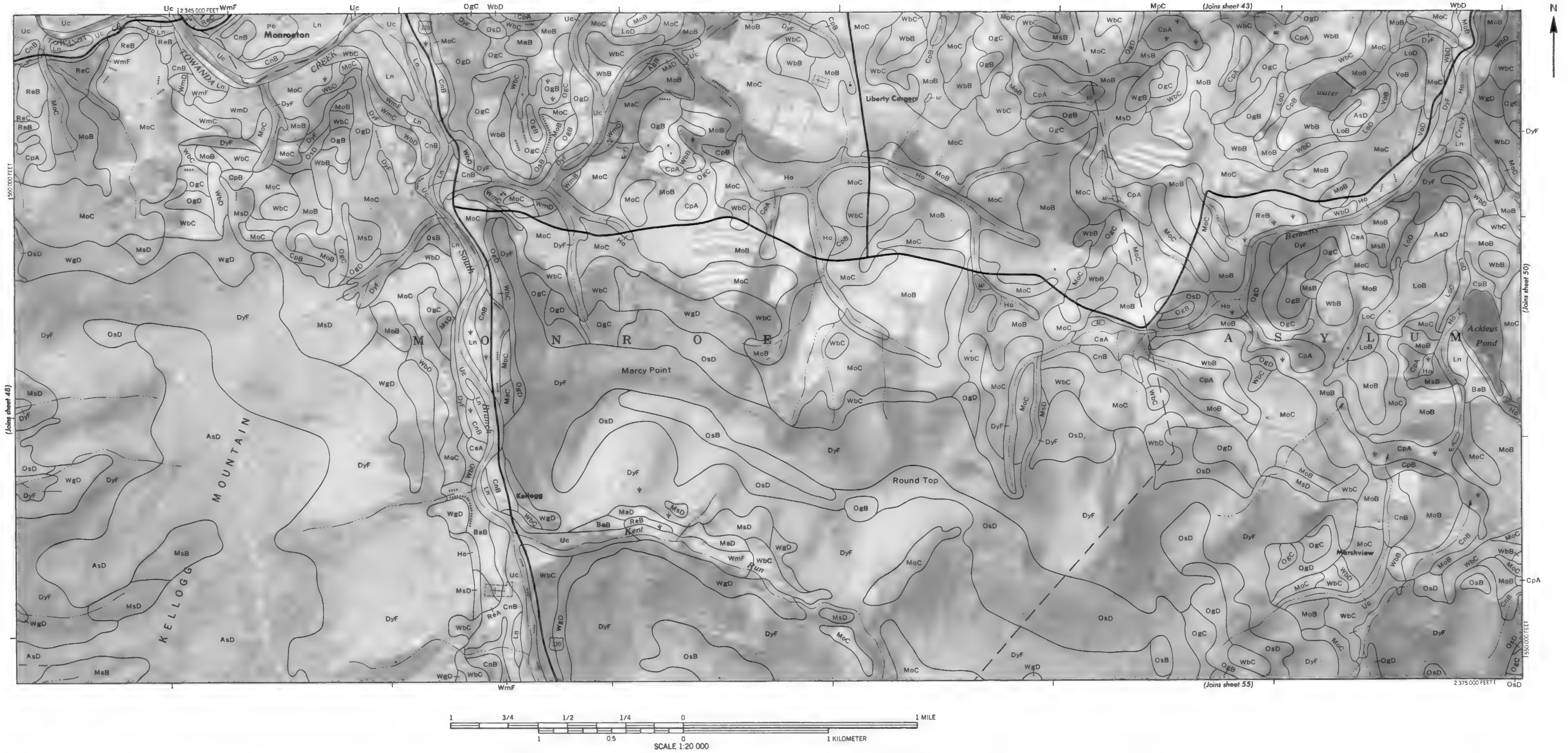


1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000


48
N
FRANKLIN
MONROE
OVERTON
Franklin Center
Franklindale
Powell
Weston
Lamoka Mountain
Stone Mountain
Nagee Mountain
Bull Run
Cush Pond
water
TOWANDA CREEK
SOWANDA CREEK
WYALUSING CREEK
MIDDLE CREEK
Whitestone
(Joins sheet 42)
(Joins sheet 47)
(Joins sheet 49)
(Joins sheet 54)
2 340 000 FEET
2 310 000 FEET
1 500 000 FEET
1 550 000 FEET
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000


N
(Joins sheet 43)
(Joins sheet 48)
(Joins sheet 50)
(Joins sheet 55)
2 345 000 FEET
2 375 000 FEET
550 000 FEET
Monroeton
TOWANDA CREEK
Liberty Corners
MONROE
ASYLUM
Marcy Point
Round Top
KELLOGG MOUNTAIN
Kellogg
South Branch
Kent Run
Bennetts Creek
Marshview
Ackleys Pond
water
220
1 MILE
1 KILOMETER
SCALE 1:20 000

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000


2 410 000 FEET
565 000 FEET
(Joins sheet 50)
(Joins sheet 45)
(Joins sheet 57)
(Joins inset B, sheet 63)
2 440 000 FEET
555 000 FEET
WmF
Uc
WmD
N
WYALUSING
MOUNTAIN
TUSCARORA
BROWNTOWN
WILMOT
Merryall
Spring Hill
Silvara
Tuscarora
CONRAIL
SUSQUEHANNA
RIVER
Creek
Pond
SCALE 1:20 000
1 MILE
1 KILOMETER

N

1 3/4 1/2 1/4 0 1 MILE

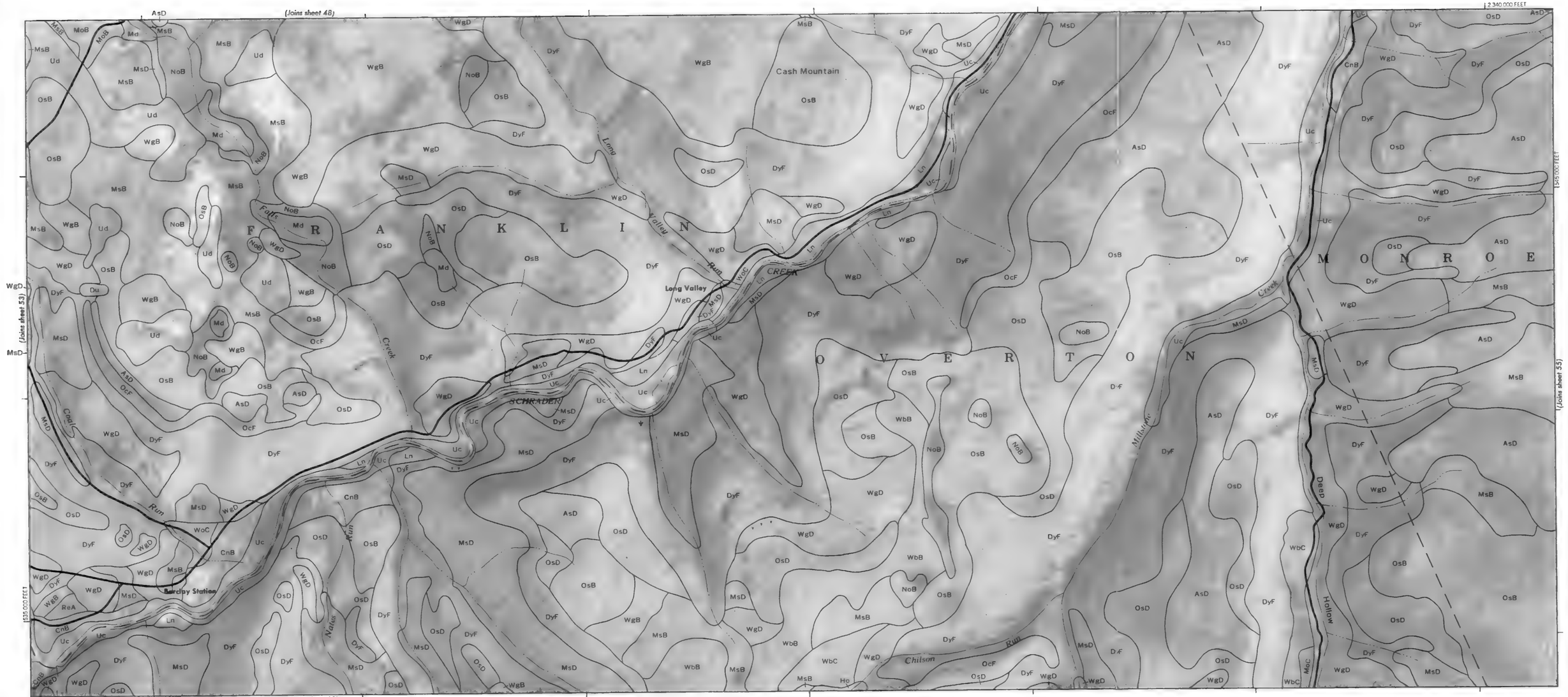
1 0.5 0 1 KILOMETER

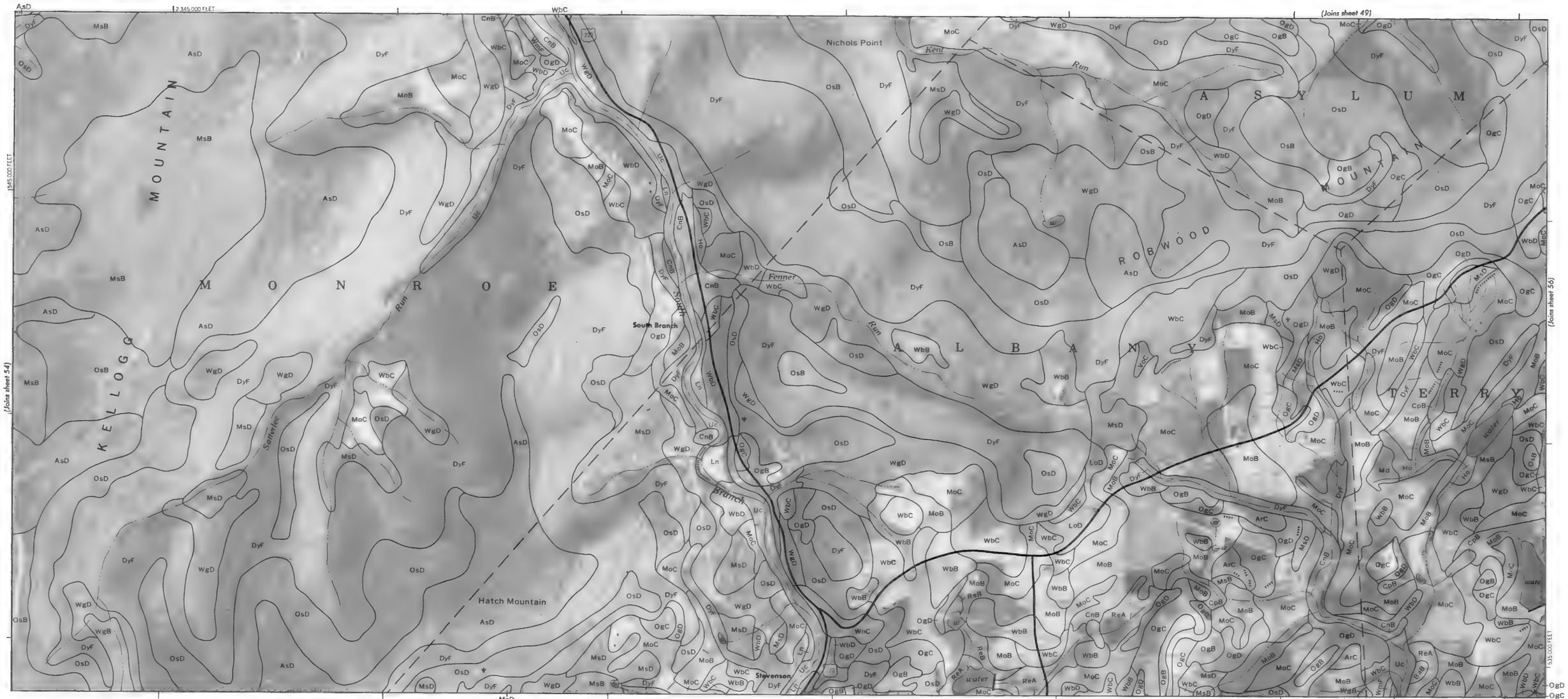
SCALE 1:20 000

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

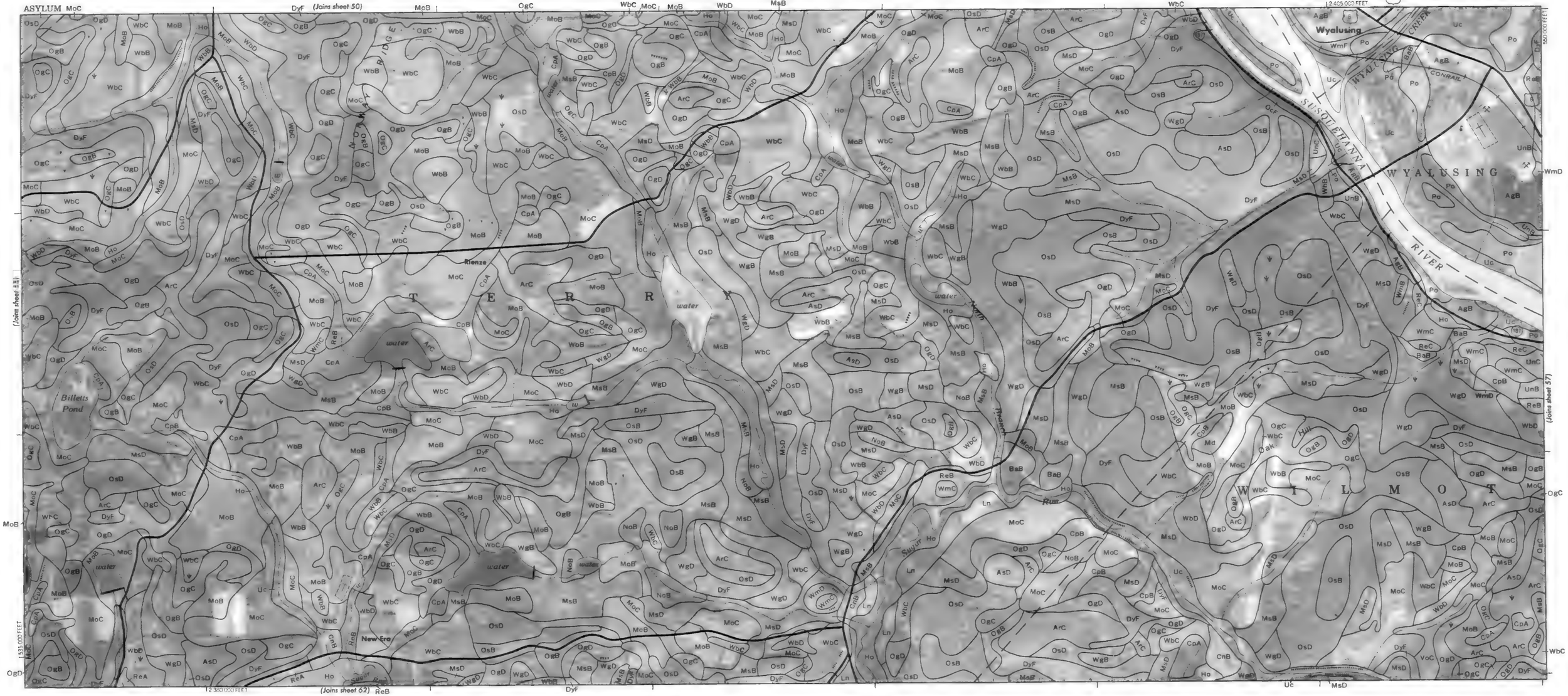

54
N
(Joins sheet 48)
(Joins sheet 53)
(Joins sheet 55)
(Joins sheet 60)
2 340 000 FEET
2 310 000 FEET
1 535 000 FEET
1 545 000 FEET
F R A N K L I N
O V E R T O N
M O N R O E
Cash Mountain
Long Valley
Barclay Station
Long Valley Run
Valley Run
Falls Creek
SCHRADER CREEK
Millstone Creek
Deep Hollow Run
Nalas Run
Chilson Run
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

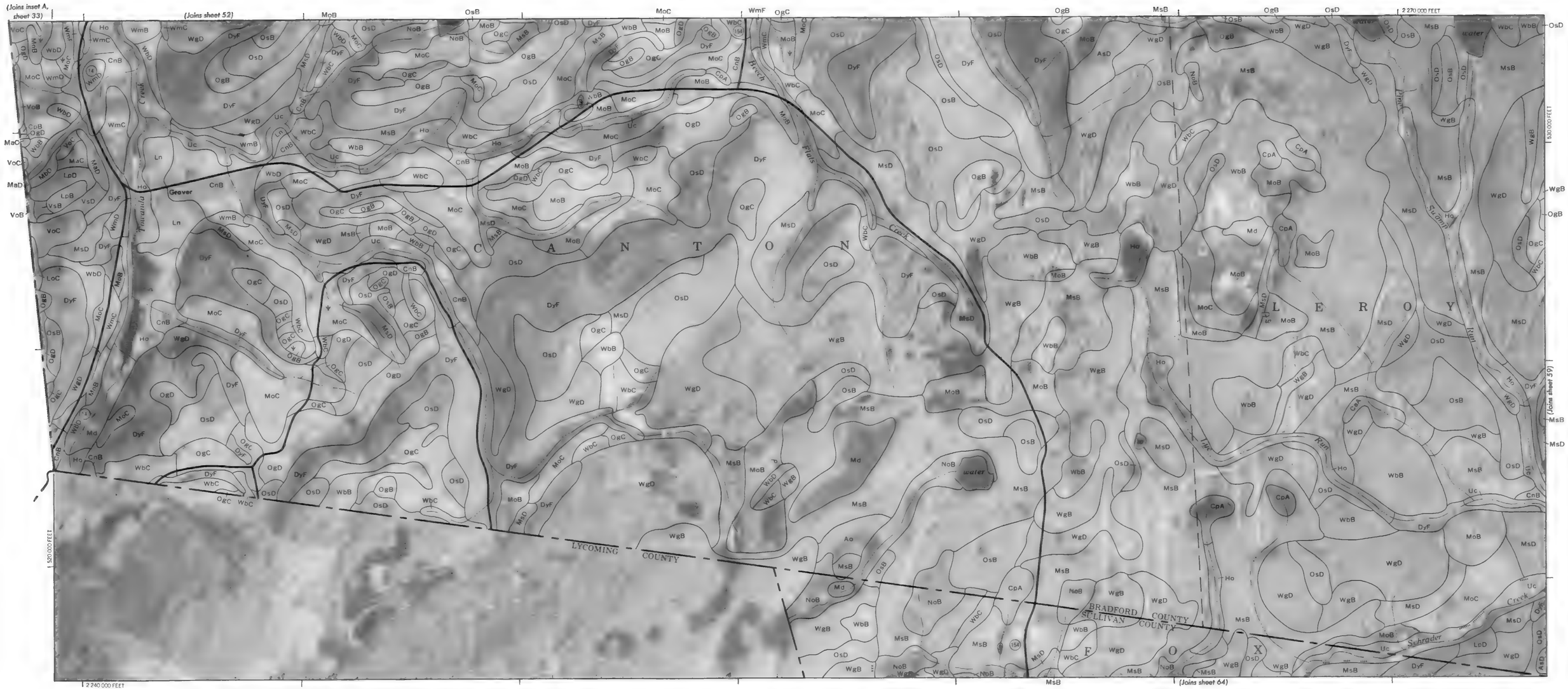
SCALE 1:20 000


56
N
ASYLUM
(Joins sheet 50)
(Joins sheet 55)
(Joins sheet 57)
(Joins sheet 62)
2 340 000 FEET
2 405 000 FEET
535 000 FEET
550 000 FEET
Wyalusing
WYALUSING
TERRY
WILMOT
Rienze
New Era
Billetts Pond
water
WYALUSING CREEK
SUSQUEHANNA RIVER
CONRAIL
Hill
Oak
Run
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

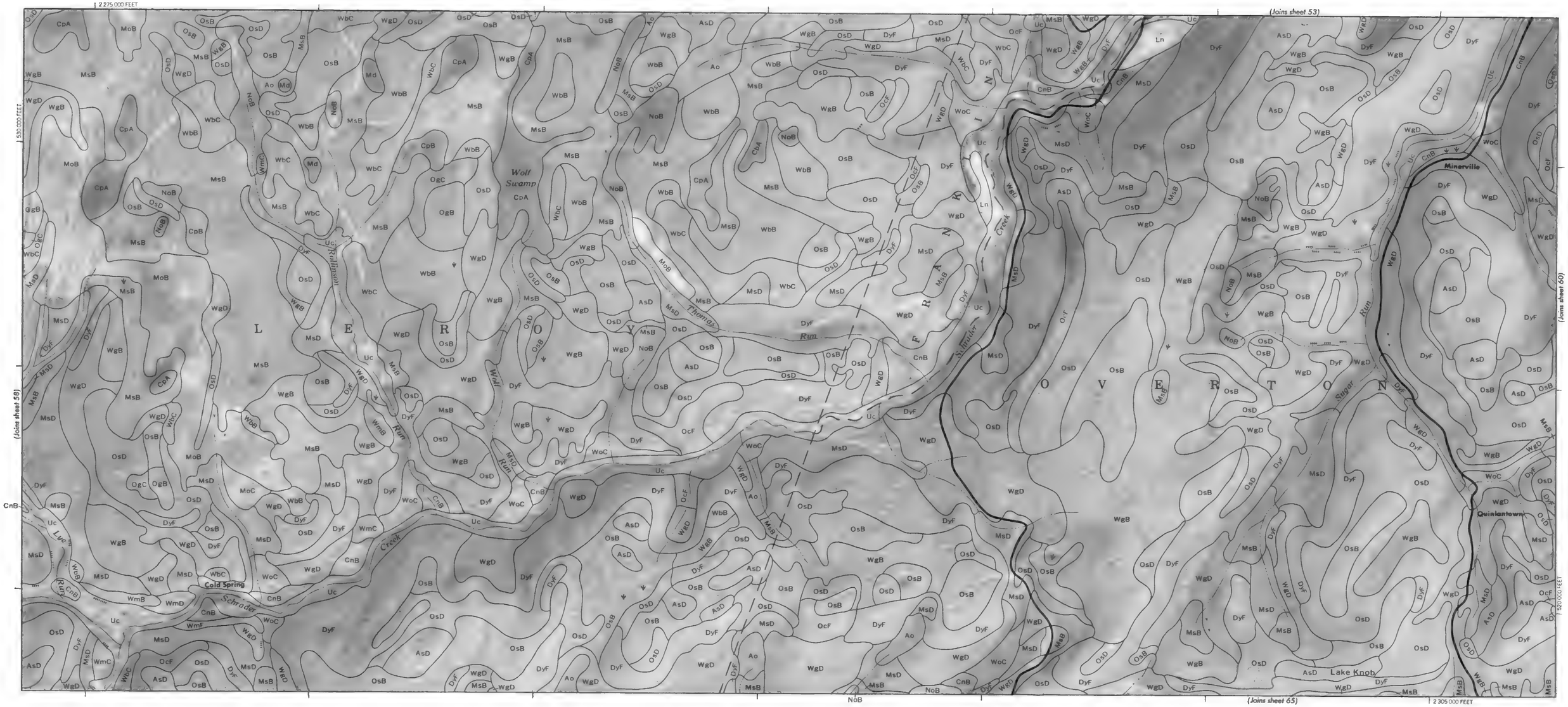
SCALE 1:20 000



SCALE 1:20 000

1 MILE 3/4 1/2 1/4 0

1 KILOMETER 0.5 0



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

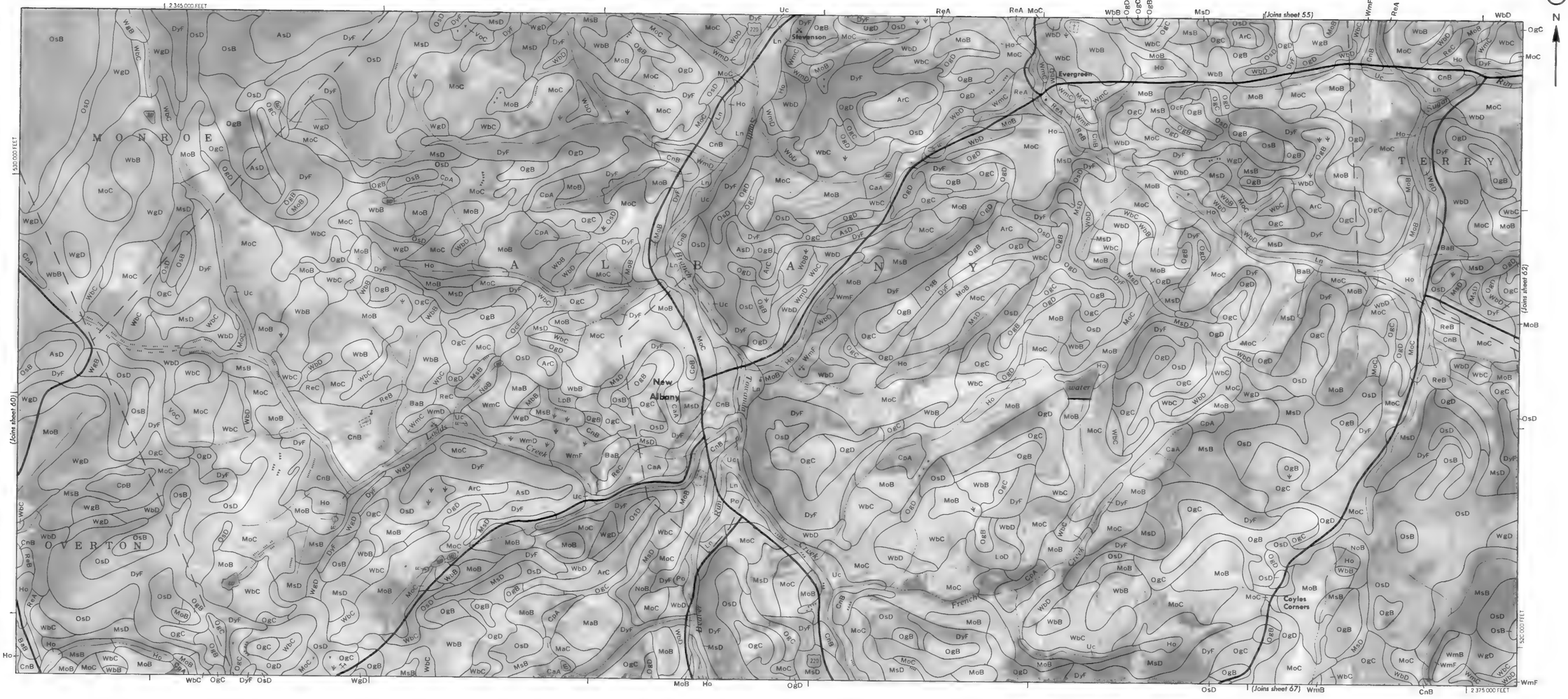
SCALE 1:20 000

59

N

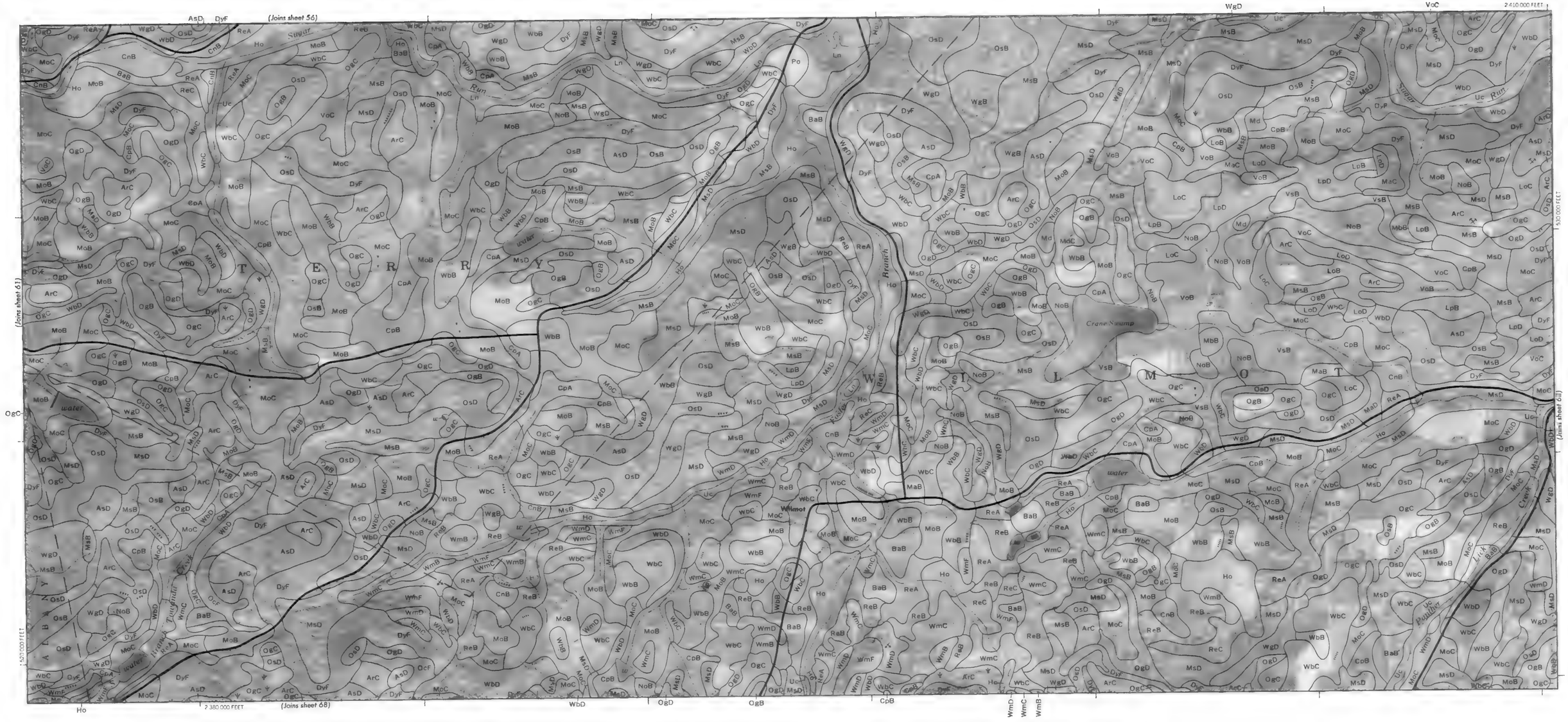

60
N
(Joins sheet 54)
(Joins sheet 59)
(Joins sheet 61)
(Joins sheet 66)
2 345 000 FEET
2 310 000 FEET
530 000 FEET
520 000 FEET
MONROE
OVERTON
Cahill Mountain
Collins Hill
Huckleberry Mountain
Nutes Run
Ho Run
Chisum Creek
Lick Creek
Wilson Creek
water
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

BRADFORD AND SULLIVAN COUNTIES, PENNSYLVANIA — SHEET NUMBER 61



62

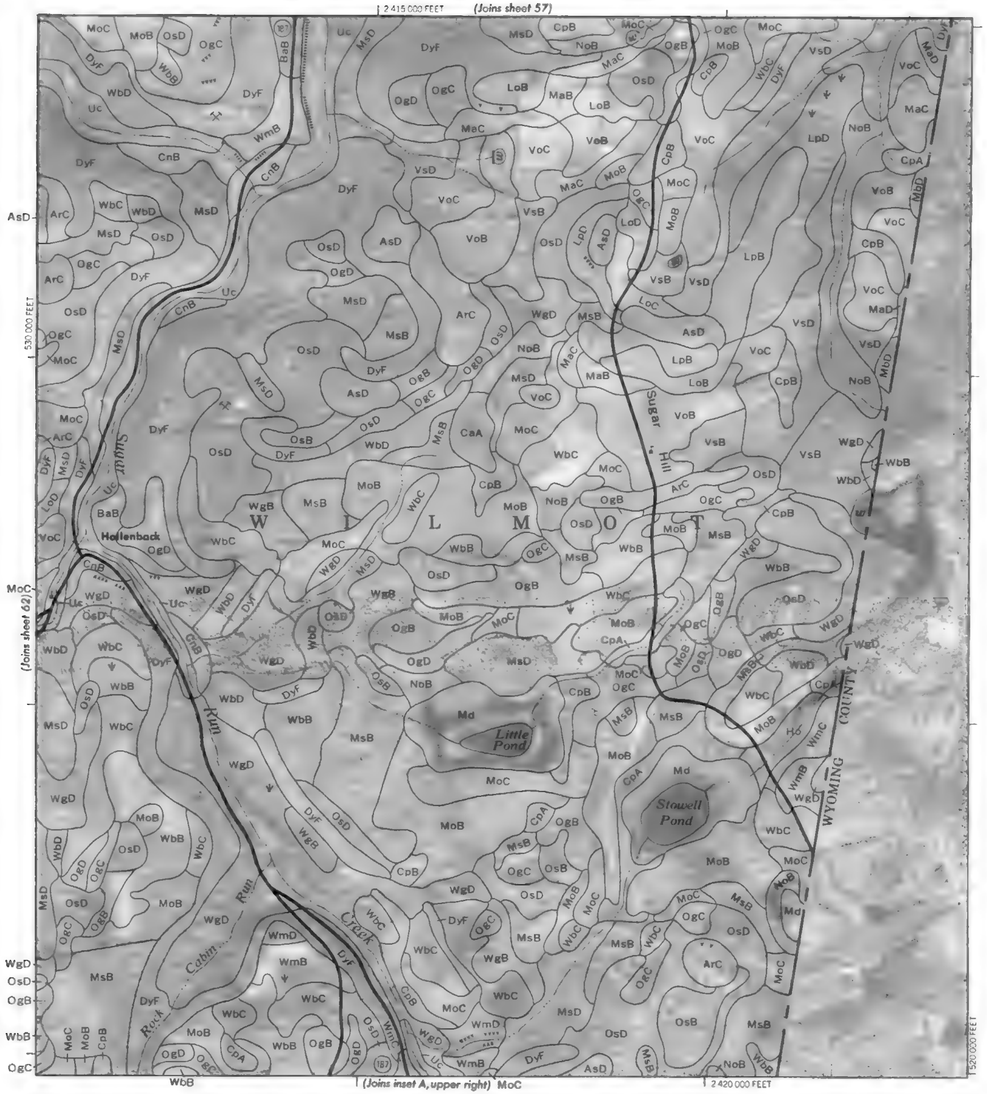
N



1 3/4 1/2 1/4 0 1 MILE

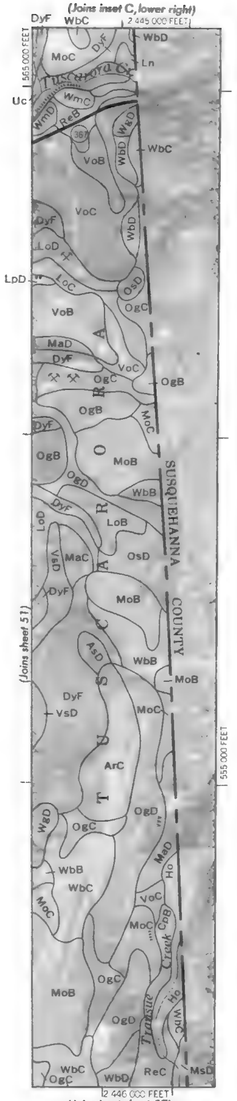
1 0.5 0 1 KILOMETER

SCALE 1:20 000

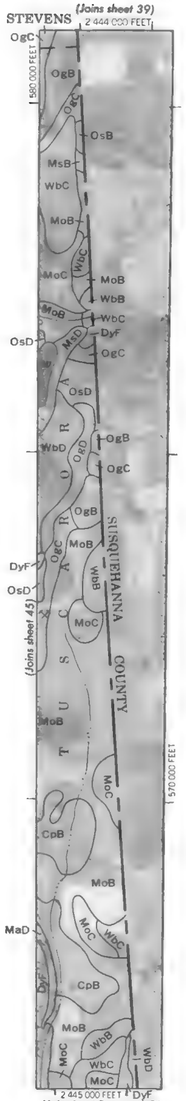


INSET A

INSET B



INSET C



63

N

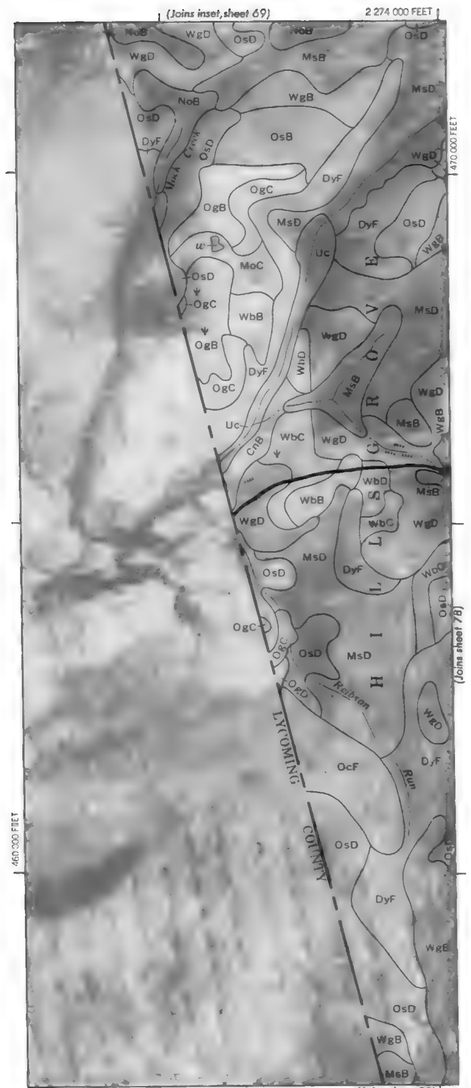
1 3/4 1/2 1/4 0 1 MILE

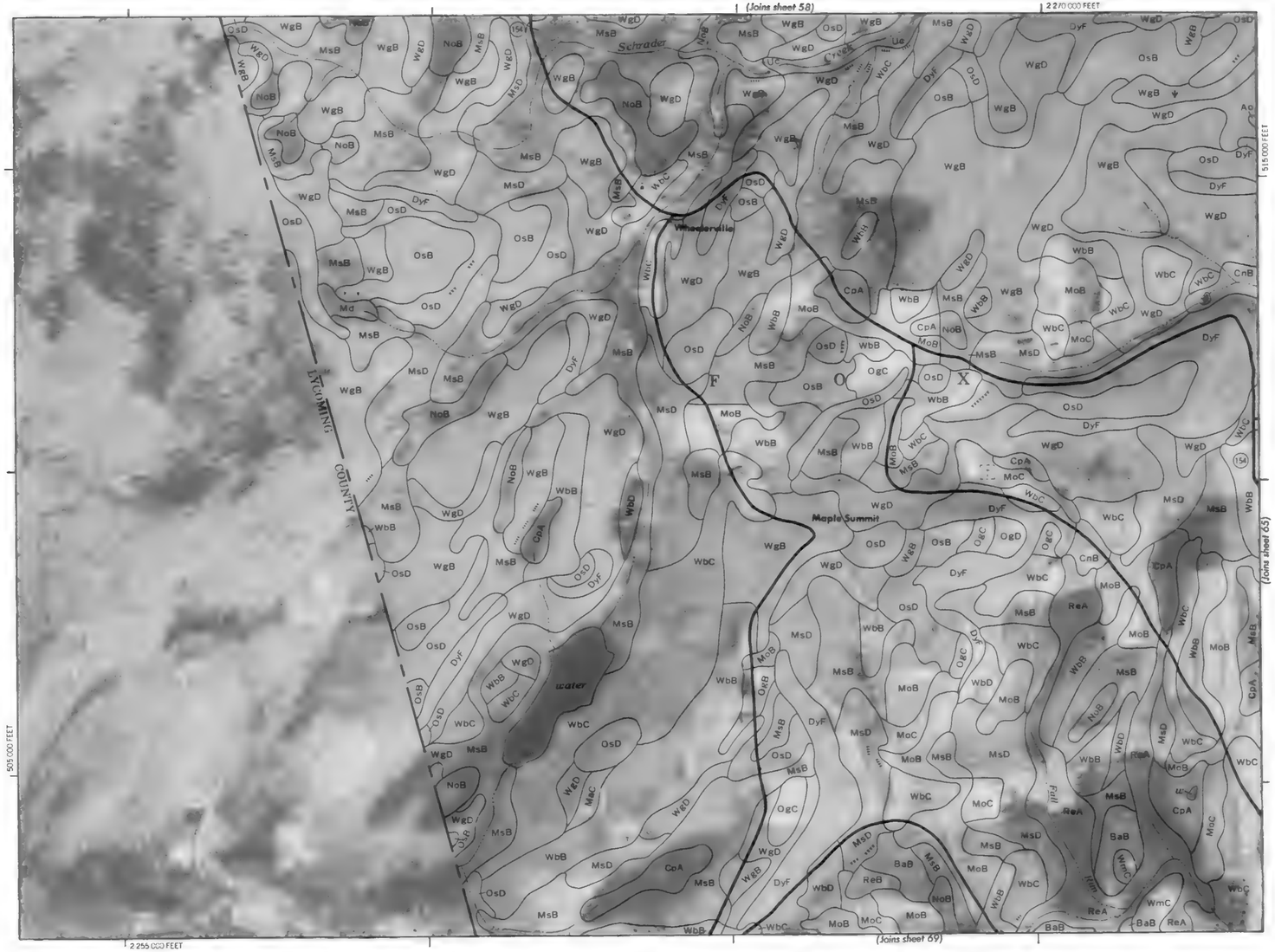
1 0.5 0 1 KILOMETER

SCALE 1:20 000

N

BRADFORD AND SULLIVAN COUNTIES, PENNSYLVANIA — SHEET NUMBER 64



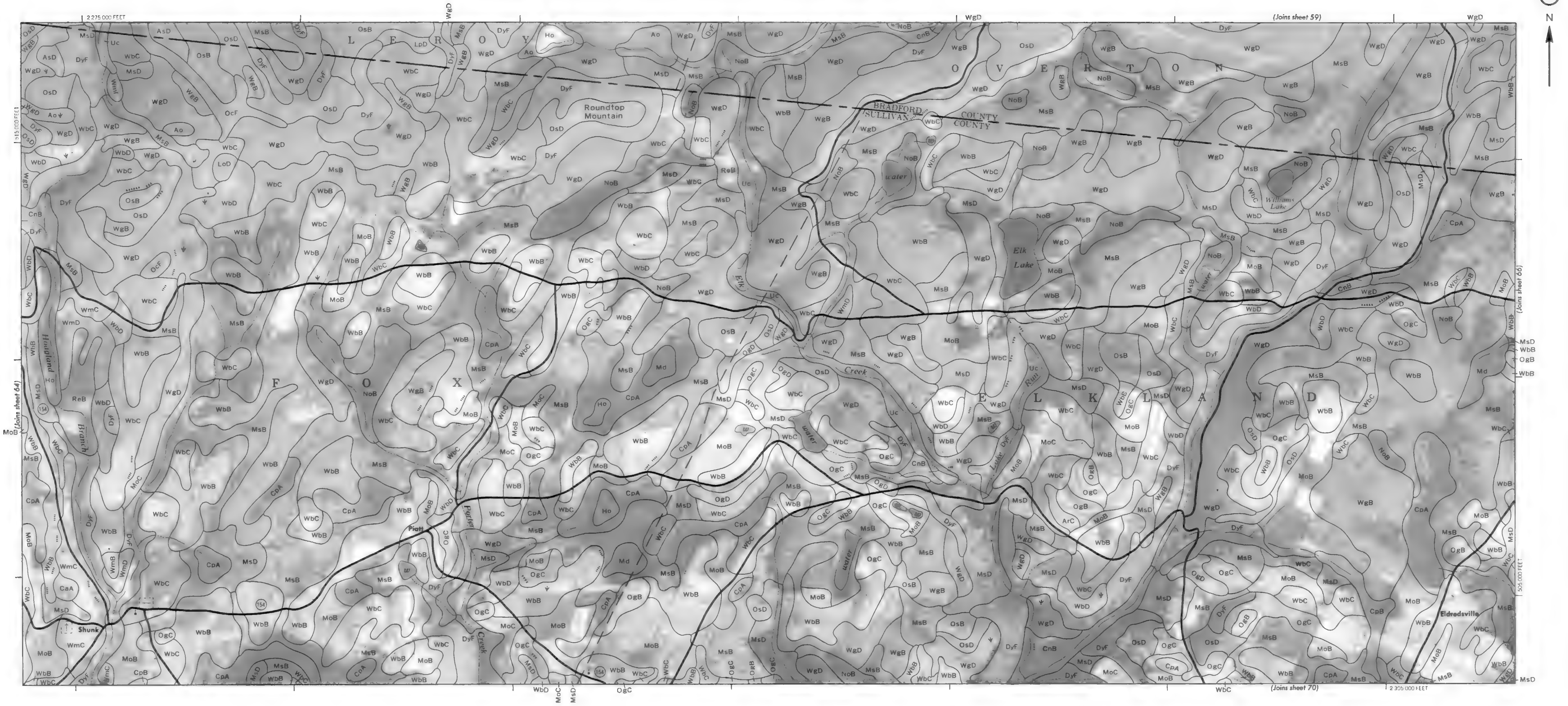


4000 AND 5000-FOOT GRID TICKS

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

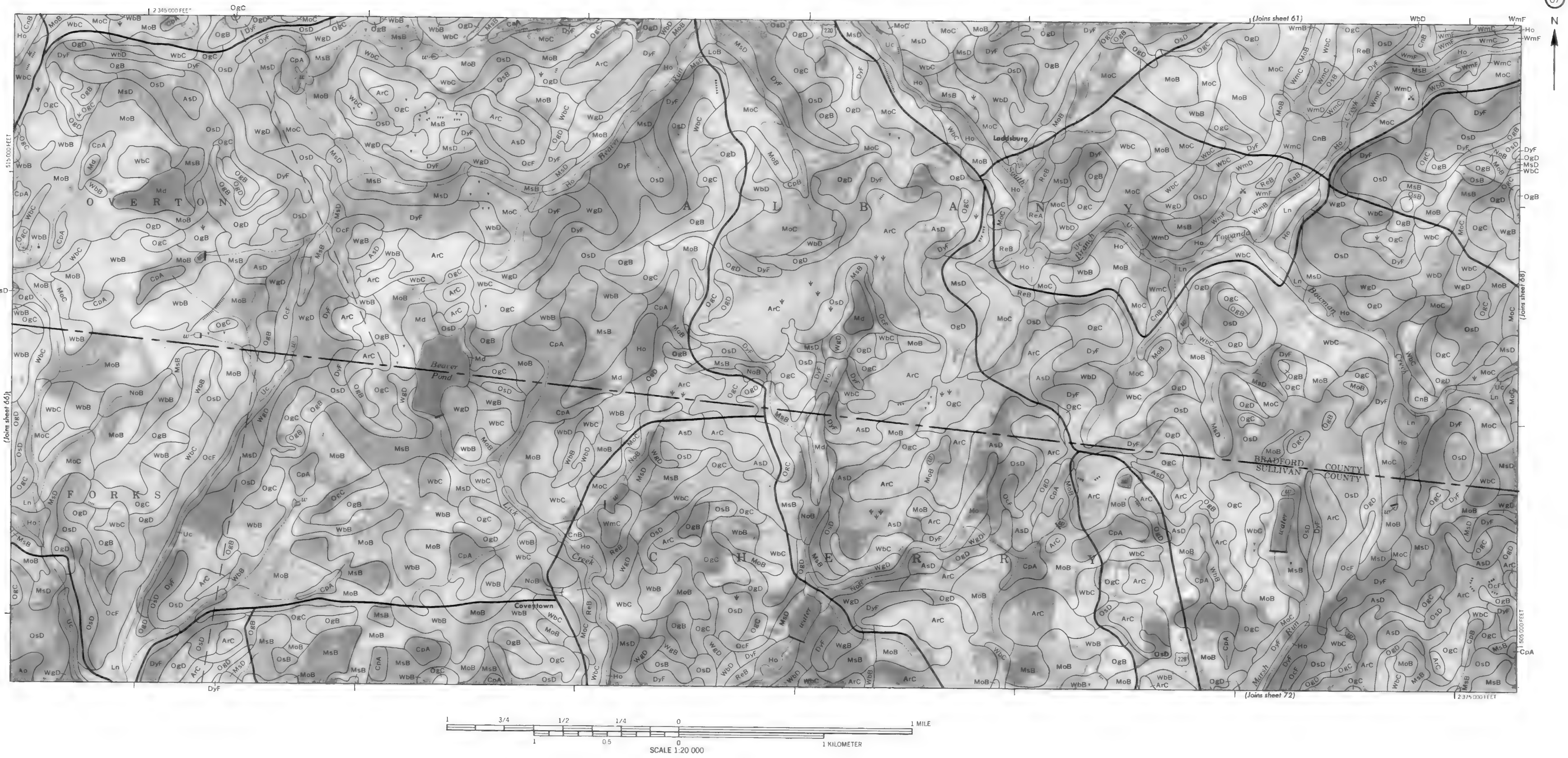


1 MILE 3/4 1/2 1/4 0 1 MILE

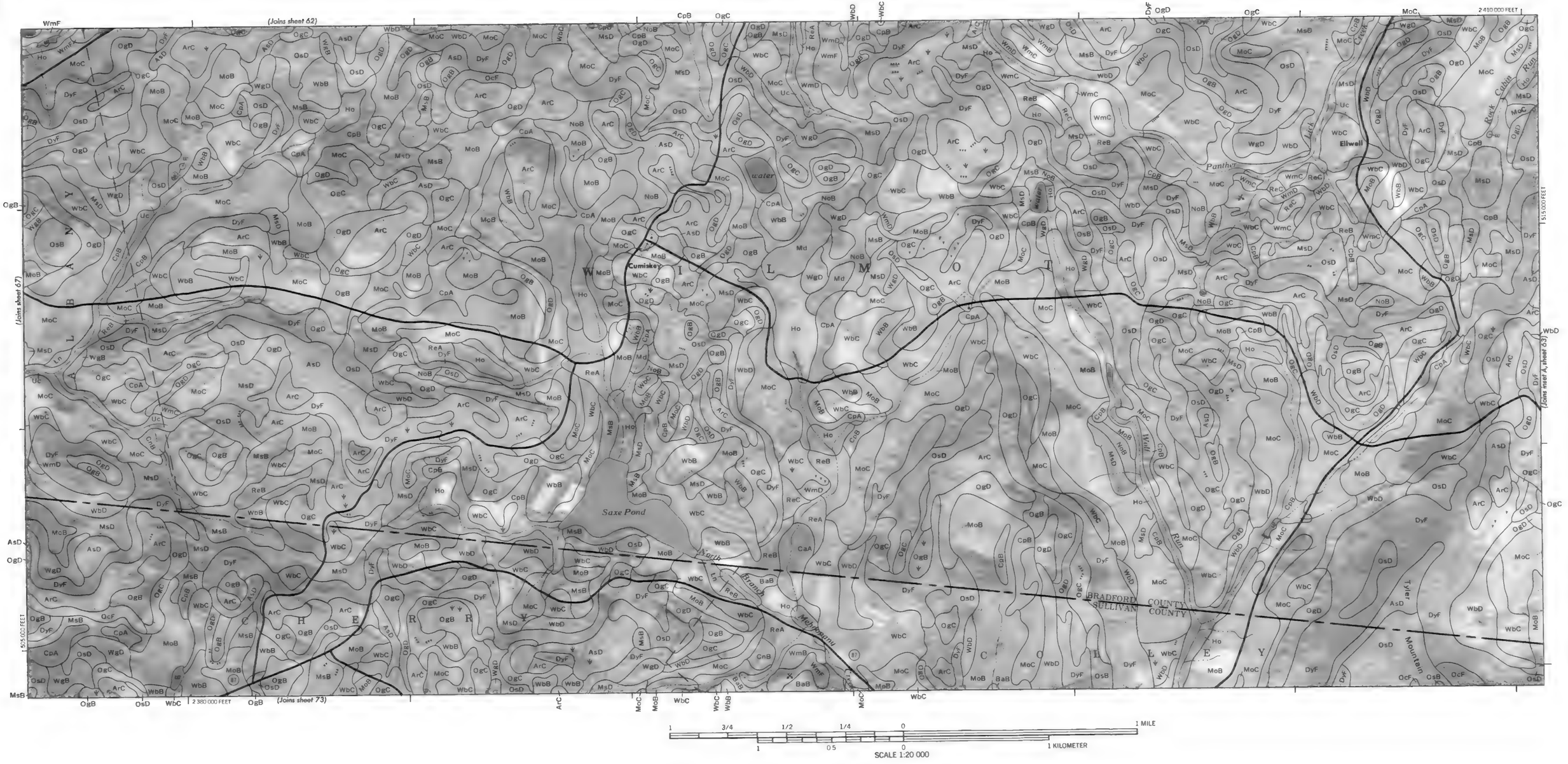
1 0.5 0 1 KILOMETER

SCALE 1:20 000


N
(Joins sheet 60)
2 340 000 FEET
515 000 FEET
505 000 FEET
2 310 000 FEET
(Joins sheet 65)
(Joins sheet 67)
(Joins sheet 71)
BRADFORD COUNTY
SULLIVAN COUNTY
ELKLAND
TOWANDA
FORKS
Burgess Pond
Hugas Corners
Bethel
Bedford Corners
Campbellville
Overton
Creek
Run
Branch
Ridge
Level
Hill
water
1 3/4 1/2 1/4 0 1 MILE
1 0 5 0 1 KILOMETER
SCALE 1:20 000


67
N
(Joins sheet 61)
(Joins sheet 72)
(Joins sheet 66)
(Joins sheet 68)
2 345 000 FEET
515 000 FEET
505 000 FEET
2 375 000 FEET
O V E R T O N
F O R K S
A L B A N Y
C H E R R Y
BRADFORD COUNTY
SULLIVAN COUNTY
Laddsburg
Coveytown
Beaver Pond
Beaver Run
South Branch
Towanda
Bowman Creek
Lick Creek
Marsh Run
water
220
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

BRADFORD AND SULLIVAN COUNTIES, PENNSYLVANIA — SHEET NUMBER 68



N

2 265 000 FEET

(Joins lower right)

Middle Branch East Mill Creek

Popple Ridge

LYCOMING COUNTY

HILLSGROVE

Big Hill

2 270 000 FEET

(Joins inset, sheet 64)

(Joins sheet 74)

2 250 000 FEET

(Joins sheet 64)

Tompkins Corners

Mill Creek

Reed Creek

LYCOMING COUNTY

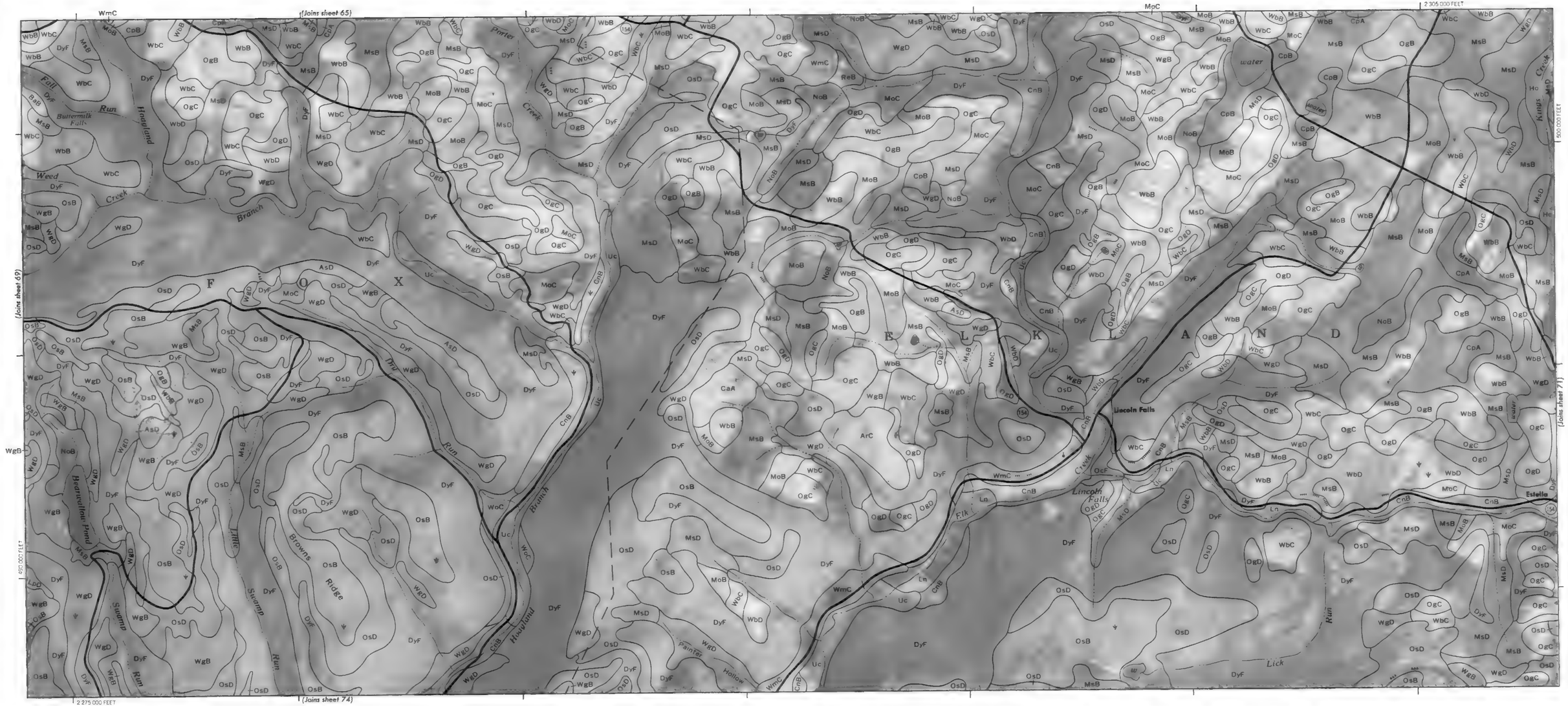
(Joins upper left) 2 270 000 FEET

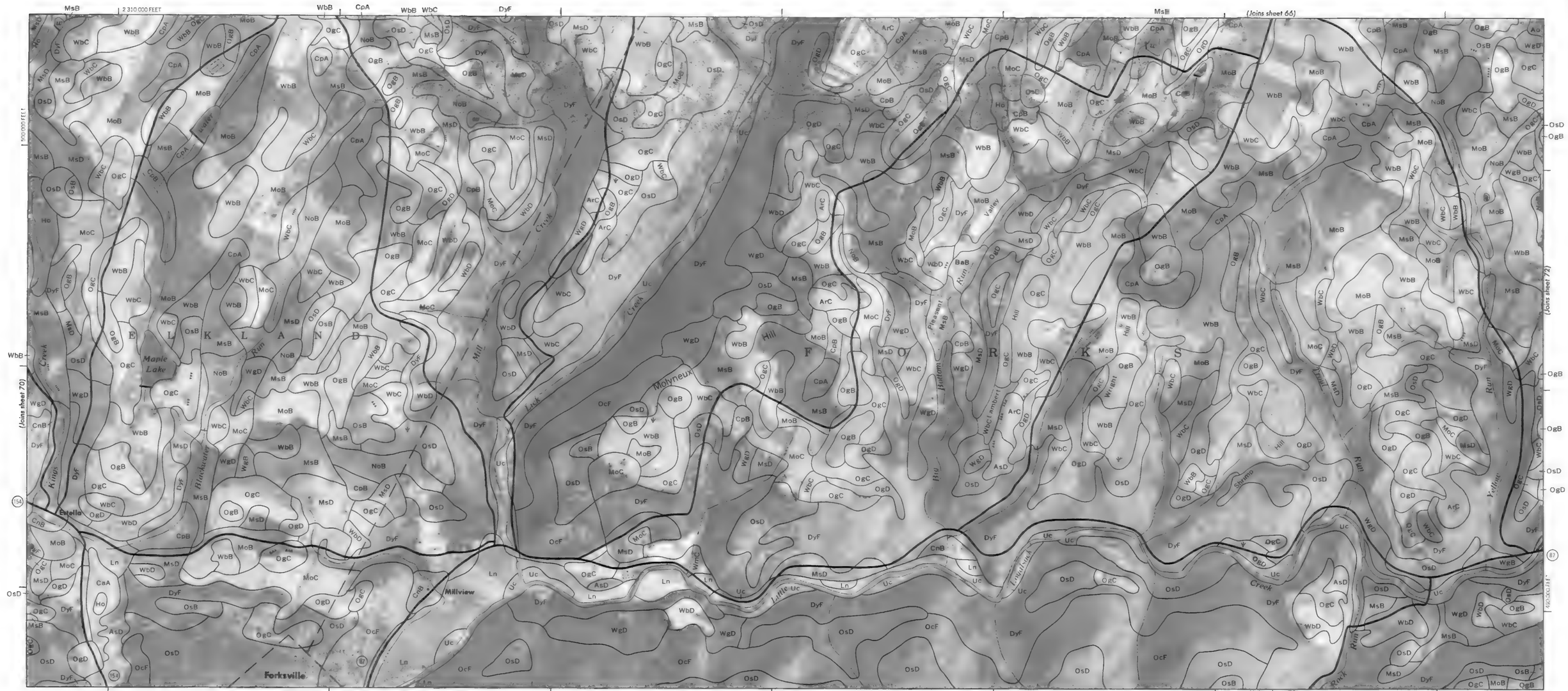
(Joins sheet 70)

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

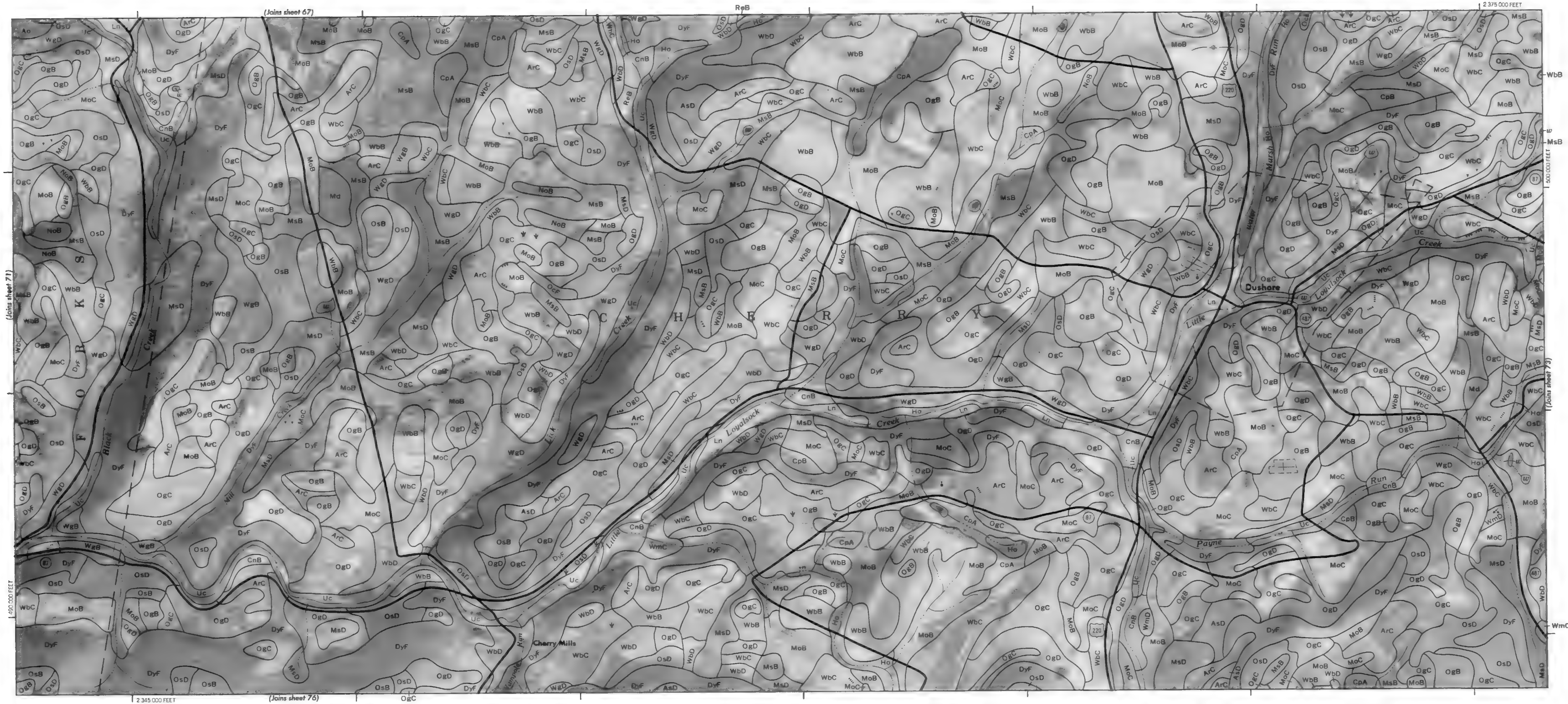
SCALE 1:20 000


70
N
(Joins sheet 65)
(Joins sheet 69)
(Joins sheet 71)
(Joins sheet 74)
2 305 000 FEET
500 000 FEET
650 000 FEET
2 275 000 FEET
FOX
BELKNAP
LAND
Lincoln Falls
Estelle
Buttermilk Falls
Houghland Branch
Weed Creek Branch
Little Browns Ridge Swamp Run
Beartrellow Pond
Painter Hollow
Lick Run
Kings Creek
water
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000


N
2 310 000 FEET
2 340 000 FEET
500 000 FEET
(Joins sheet 66)
(Joins sheet 70)
(Joins sheet 72)
(Joins sheet 75)
ELK LAND
FOX
RUSH
Maple Lake
Estella
Millview
Forksville
Molyneux Hill
Mill Creek
Lick Creek
Little Loyalsock Creek
Loyalsock Creek
Rock Run
Kings Run
Blackwater Run
Pleasant Valley
Bottom Hill
Wright Hill
Shrimp Hill
Paul Hill
Yellow Run
1 MILE
1 KILOMETER
SCALE 1:20 000

72

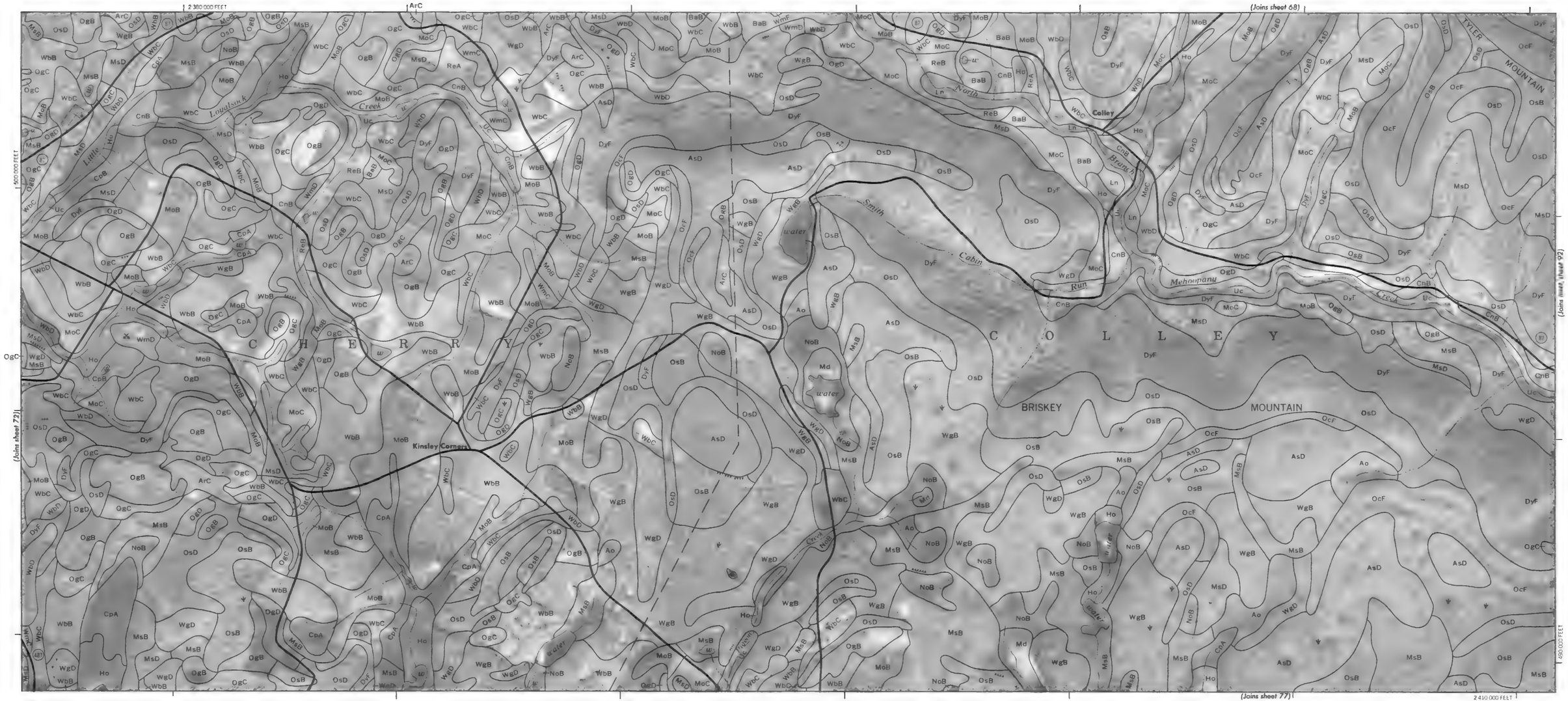
N

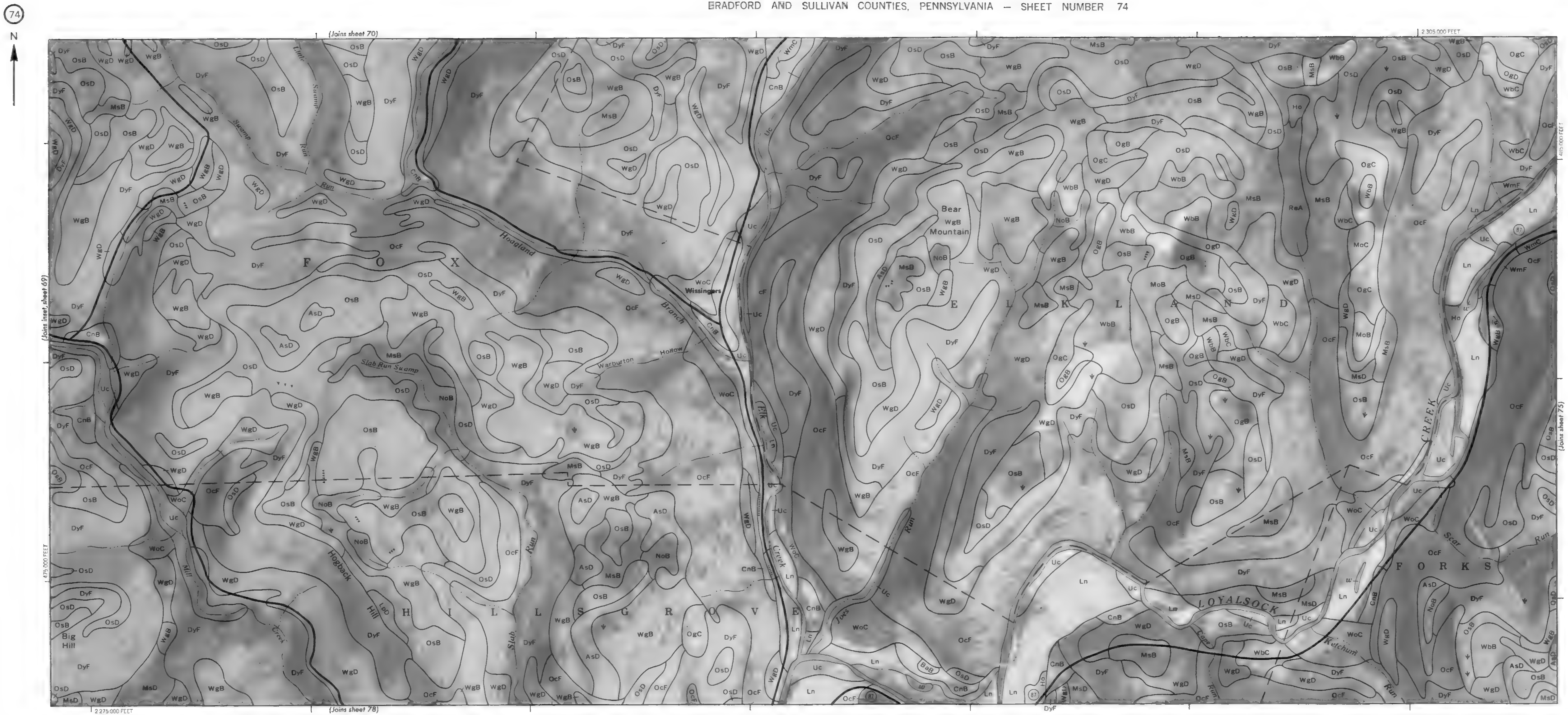


1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

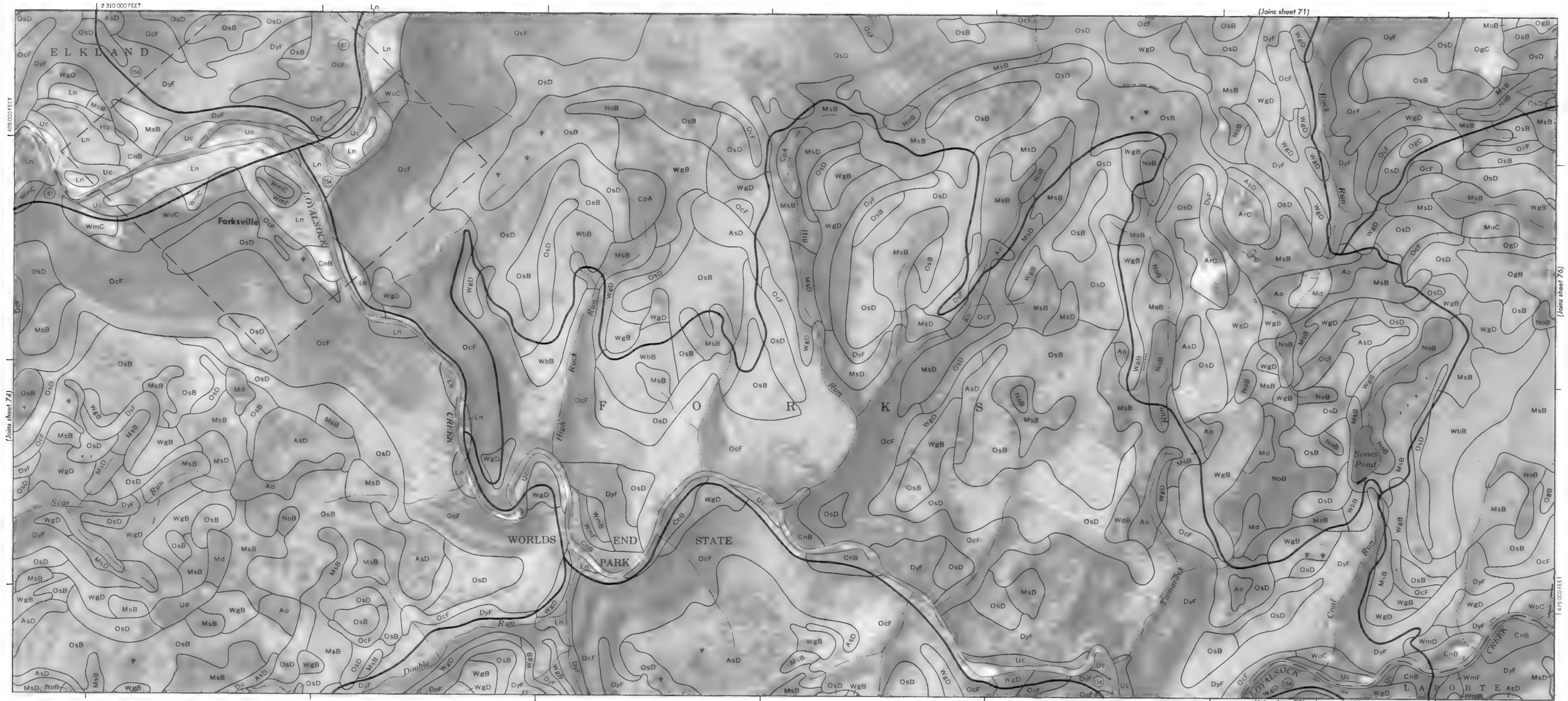

2 380 000 FEET
500 000 FEET
(Joins sheet 68)
(Joins sheet 72)
(Joins sheet 92)
(Joins sheet 77)
2 410 000 FEET
480 000 FEET
N
C H E R R Y
C O L L E Y
BRISKEY
MOUNTAIN
Kinsley Corners
Loyalsock Creek
Little Loyalsock
Smith Cabin Run
Mehoopany Creek
Brunk
Colley
North
Tyler Mountain
water
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

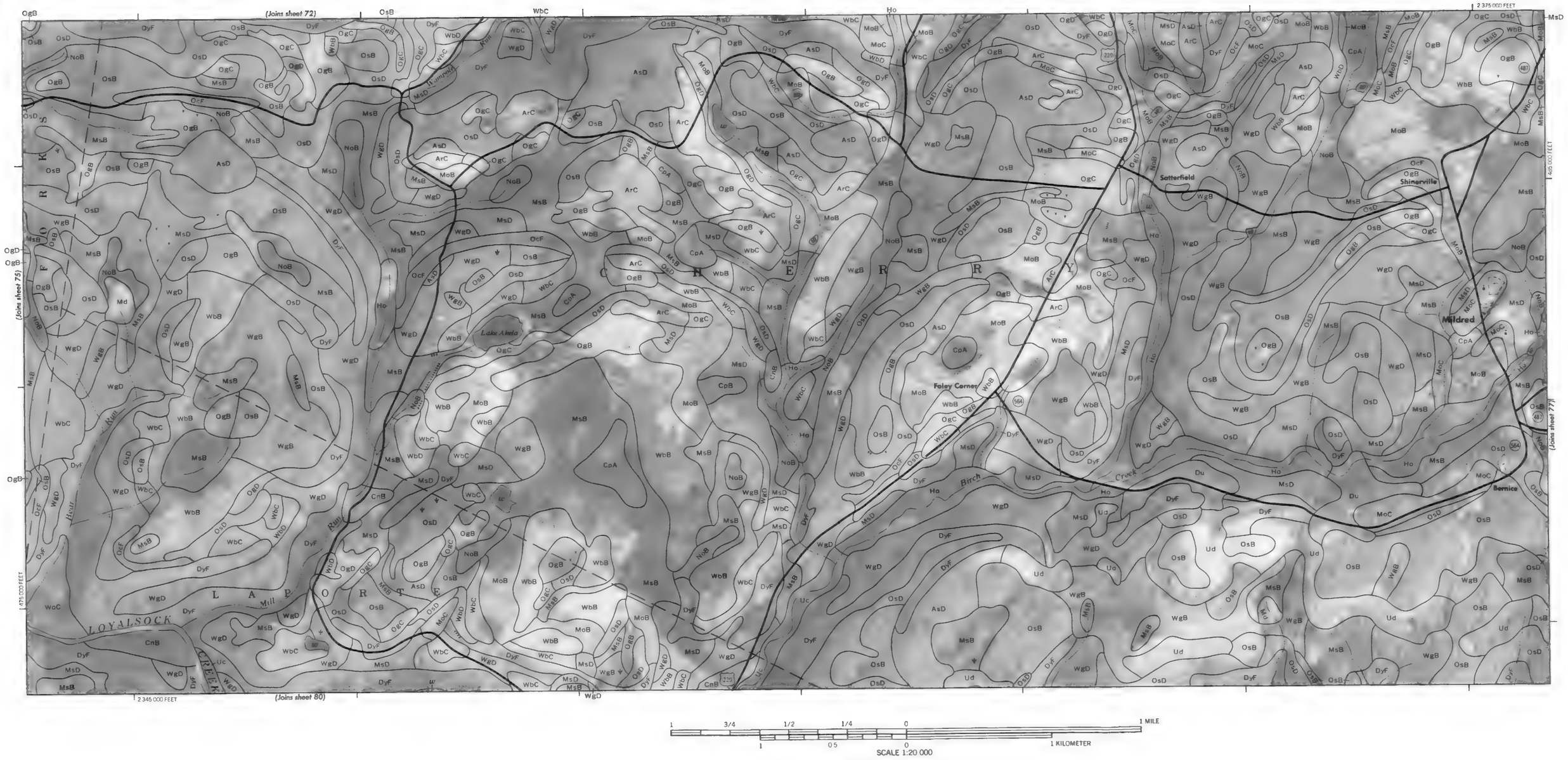
SCALE 1:20 000



1 3/4 1/2 1/4 0 1 MILE

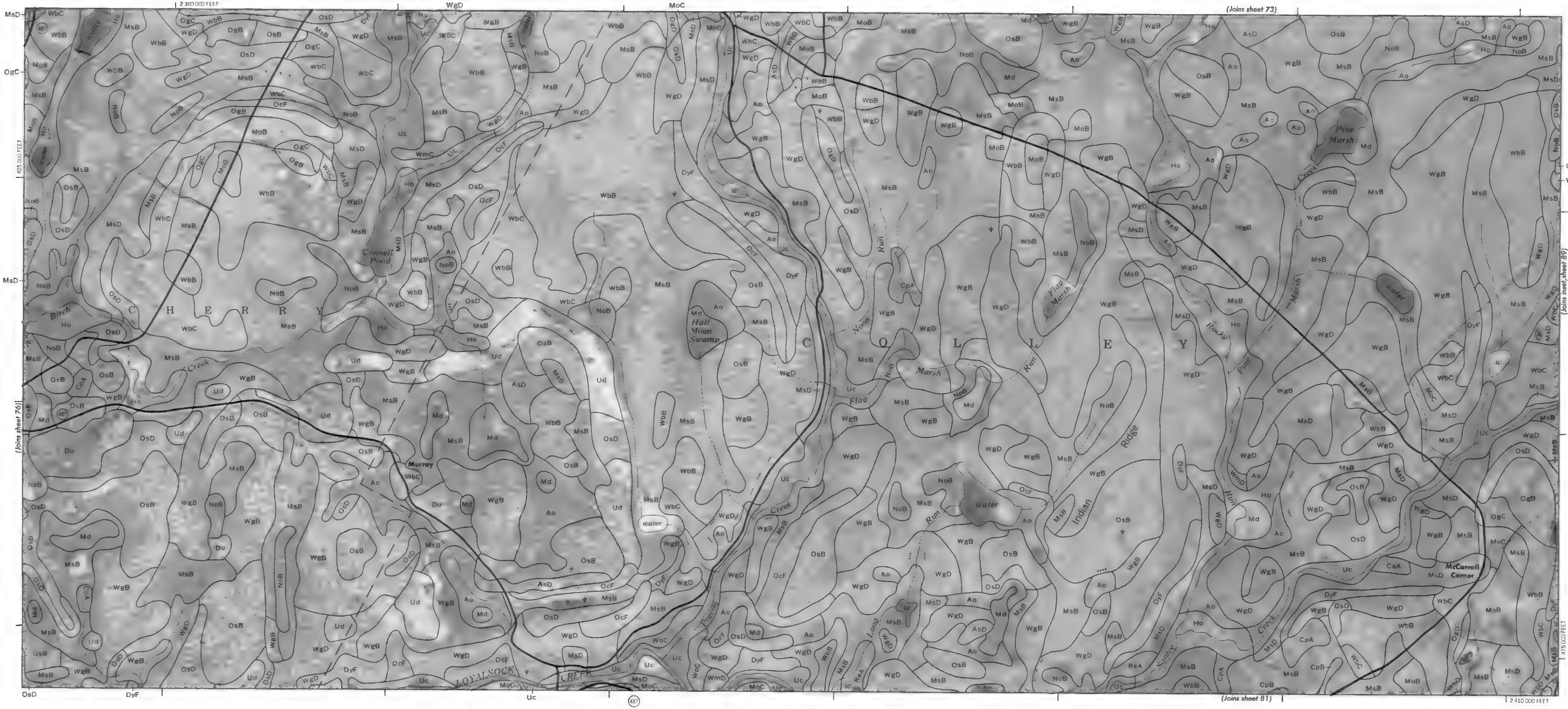
1 0.5 0 1 KILOMETER

SCALE 1:20 000


76
N
(Joins sheet 72)
(Joins sheet 75)
(Joins sheet 77)
(Joins sheet 80)
2 375 000 FEET
2 345 000 FEET
1 475 000 FEET
1 505 000 FEET
Satterfield
Shinerville
Mildred
Foley Corner
Bernice
Lake Aleola
LOYALSOCK CREEK
Birch Creek
Mill Run
Hunt Run
Run
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

77

N



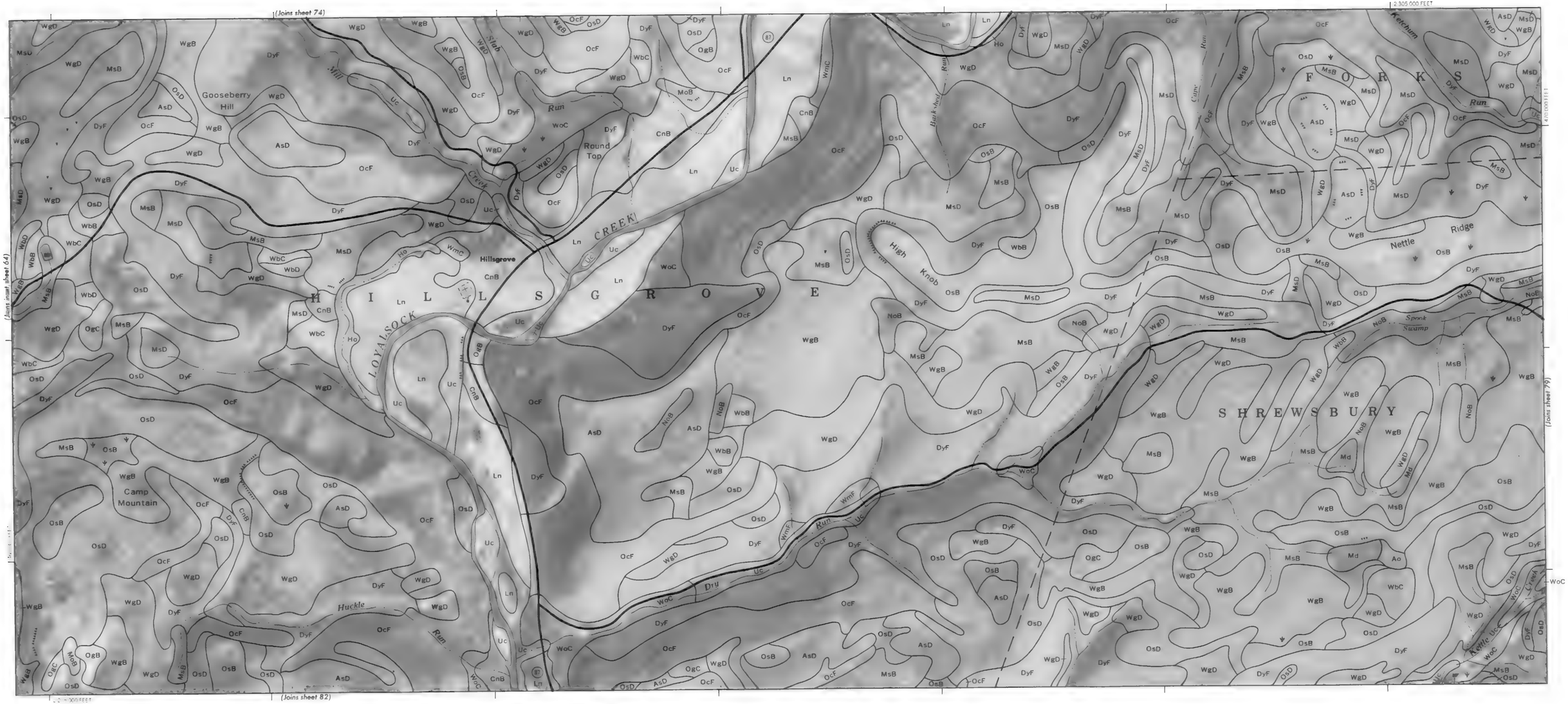
1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

78

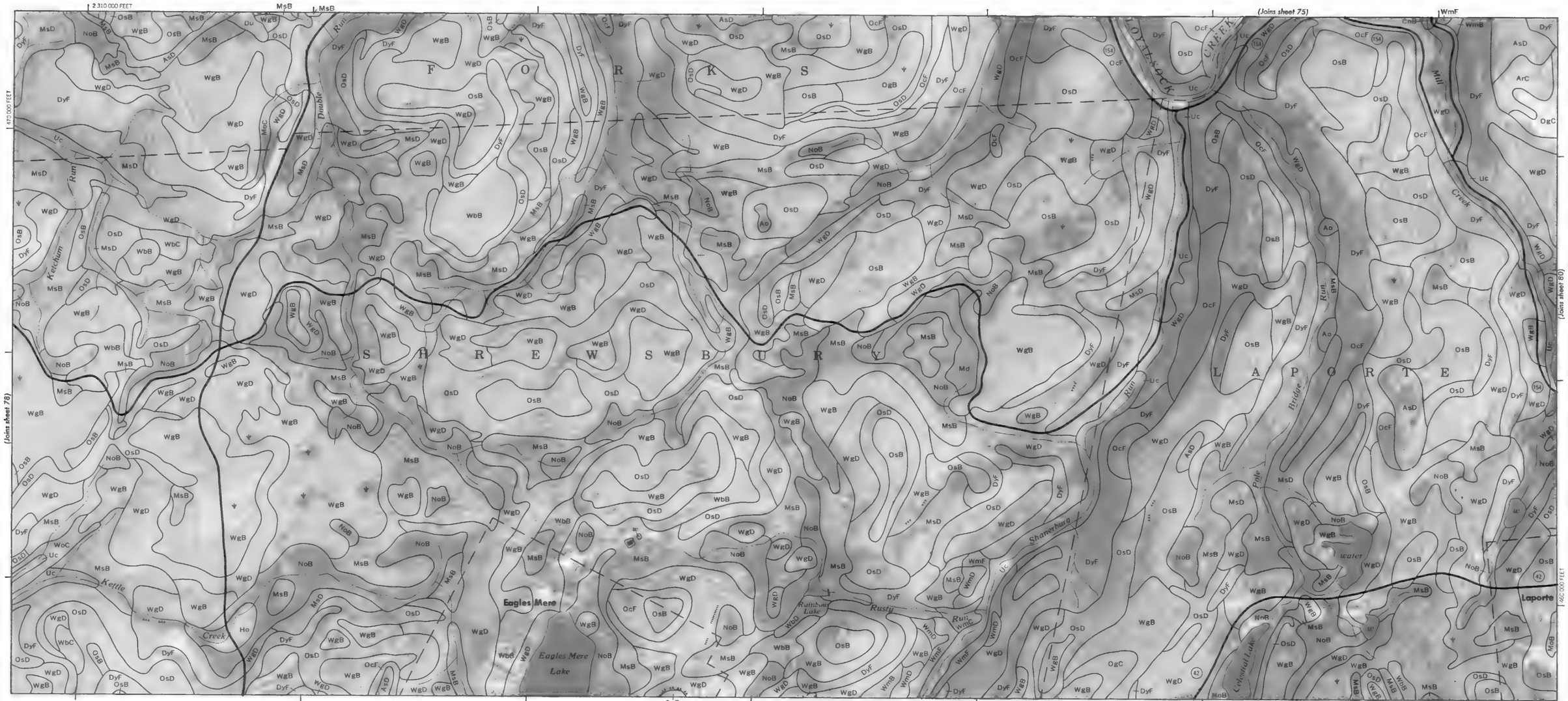
N



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

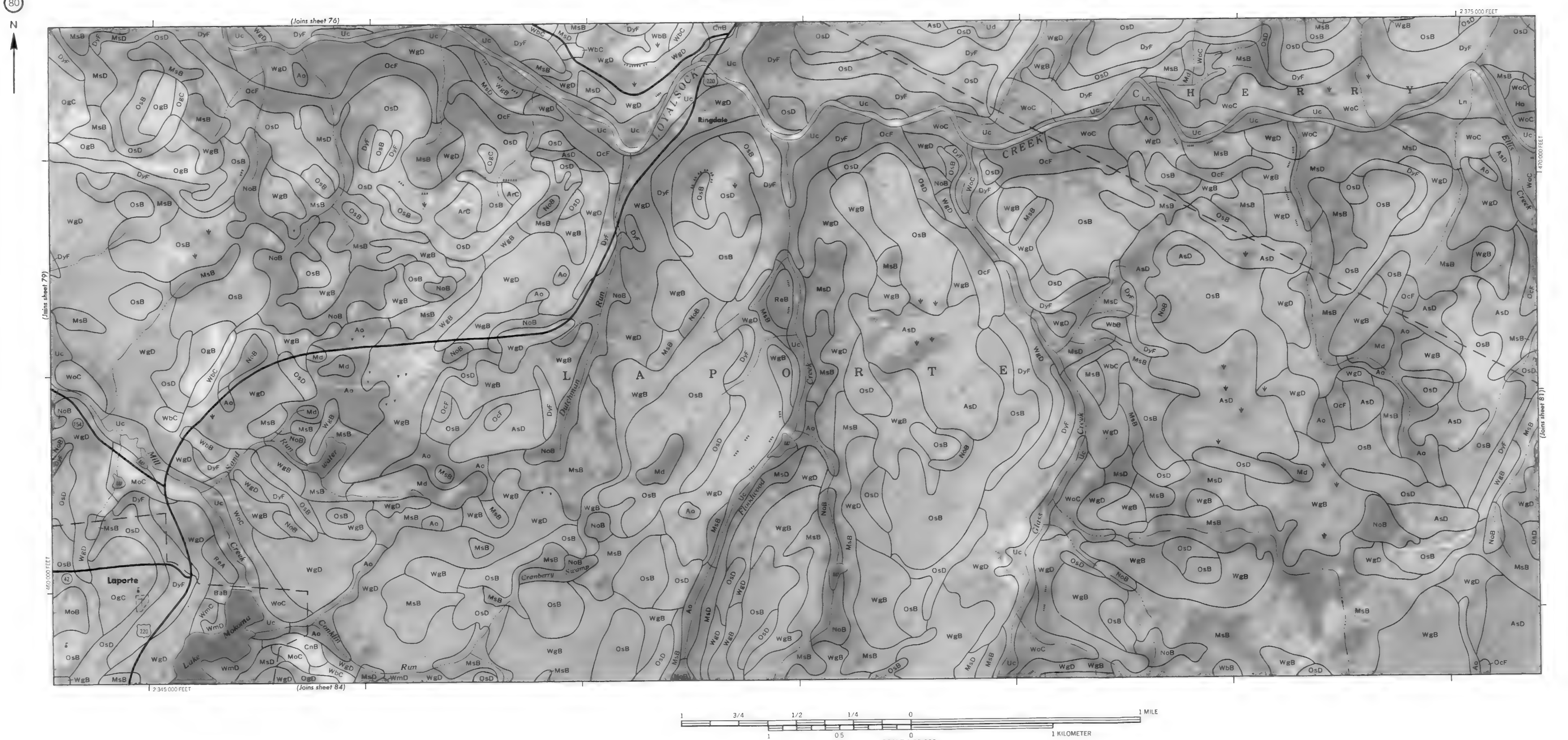
SCALE 1:20 000

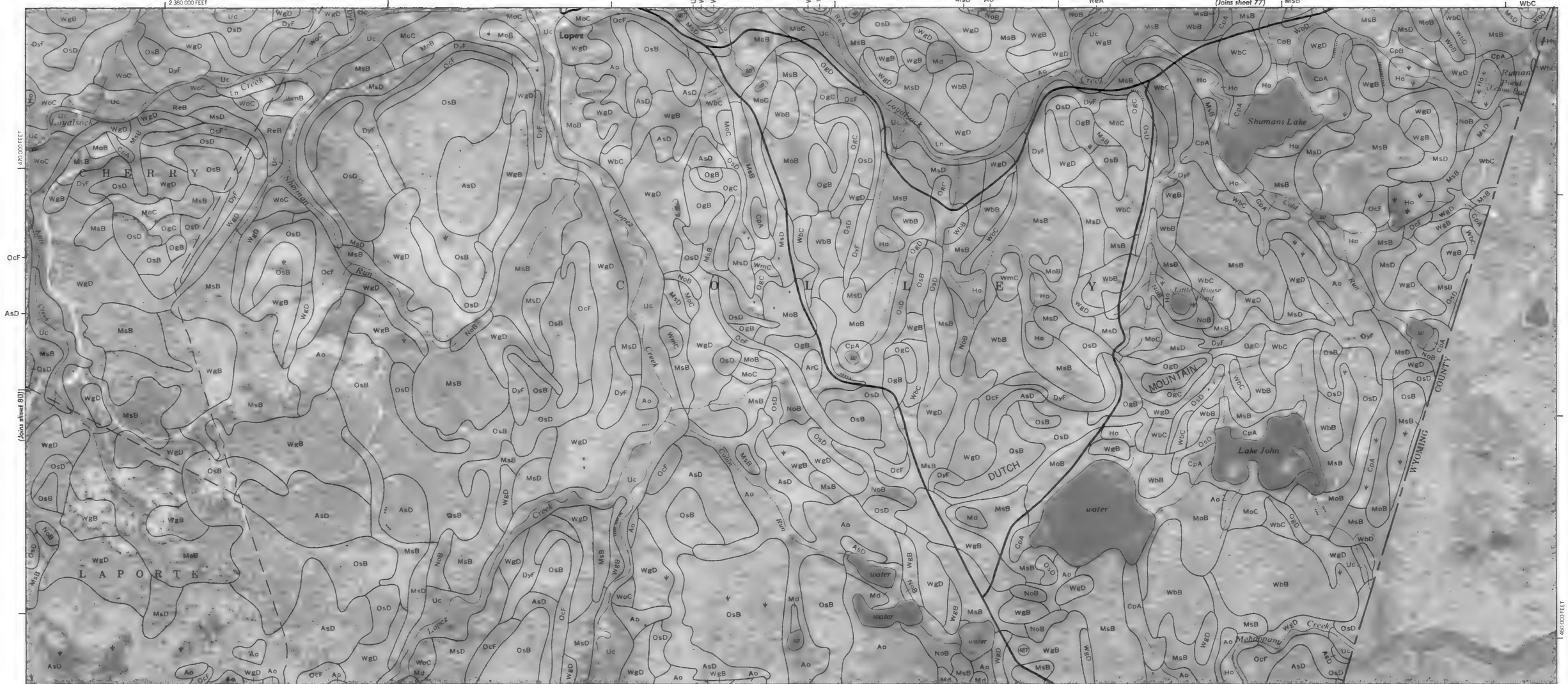


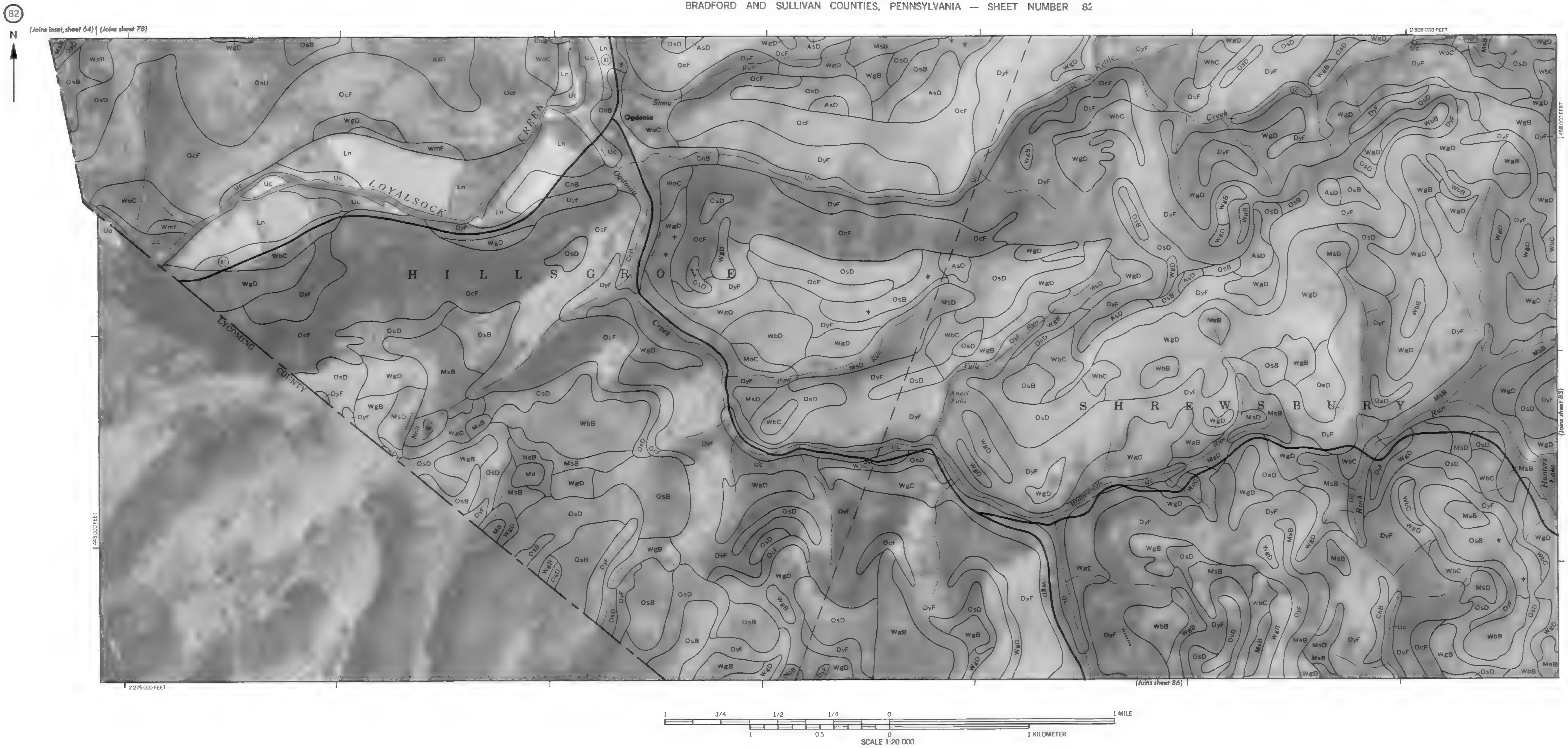
1 3/4 1/2 1/4 0 1 MILE

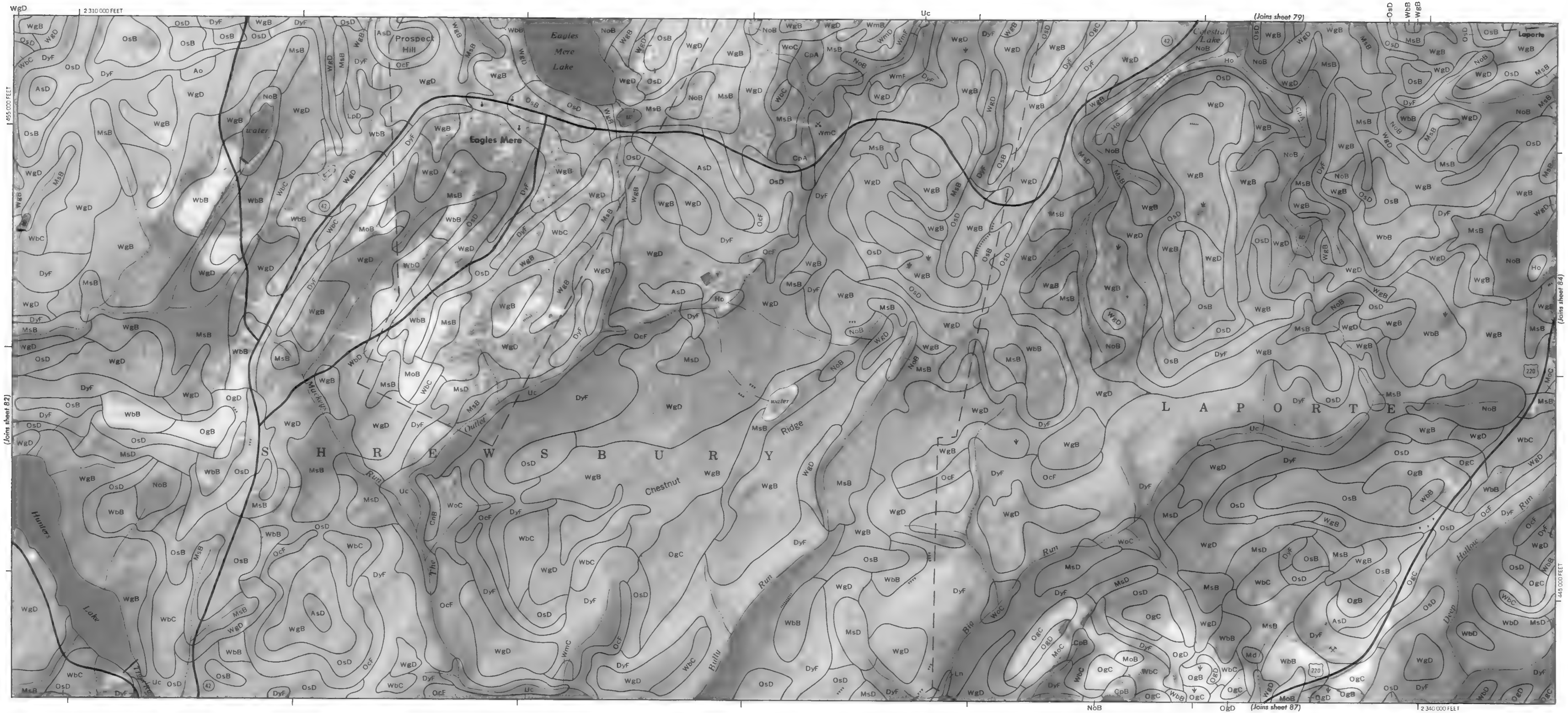
1 0.5 0 1 KILOMETER

SCALE 1:20 000


N
(Joins sheet 76)
(Joins sheet 79)
(Joins sheet 81)
(Joins sheet 84)
2 375 000 FEET
2 345 000 FEET
470 000 FEET
460 000 FEET
LOYALSOCK
CREEK
Ringdale
L A P O R T E
C H E R R Y
Laporte
Lake Mokoma
Dutchman Run
Flodwood Creek
Glass Creek
Elk Creek
Mill Creek
Sand Run
Cranberry Swamp
Conklin Run
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000


2 380 000 FEET
2 410 000 FEET
470 000 FEET
460 000 FEET
(Joins sheet 80)
(Joins sheet 85)
(Joins sheet 77)
N
CHERRY
LAPORTE
COLLEY
DUTCH MOUNTAIN
WYOMING COUNTY
Loyalsock Creek
Lopez Creek
Fisher Run
Lopez Run
Little Rouse Pond
Shumans Lake
Lake John
Ruman Pond
Mehoopany Creek
water
1 3/4 1/2 1/4 0 1 MILE
1 0.5 0 1 KILOMETER
SCALE 1:20 000

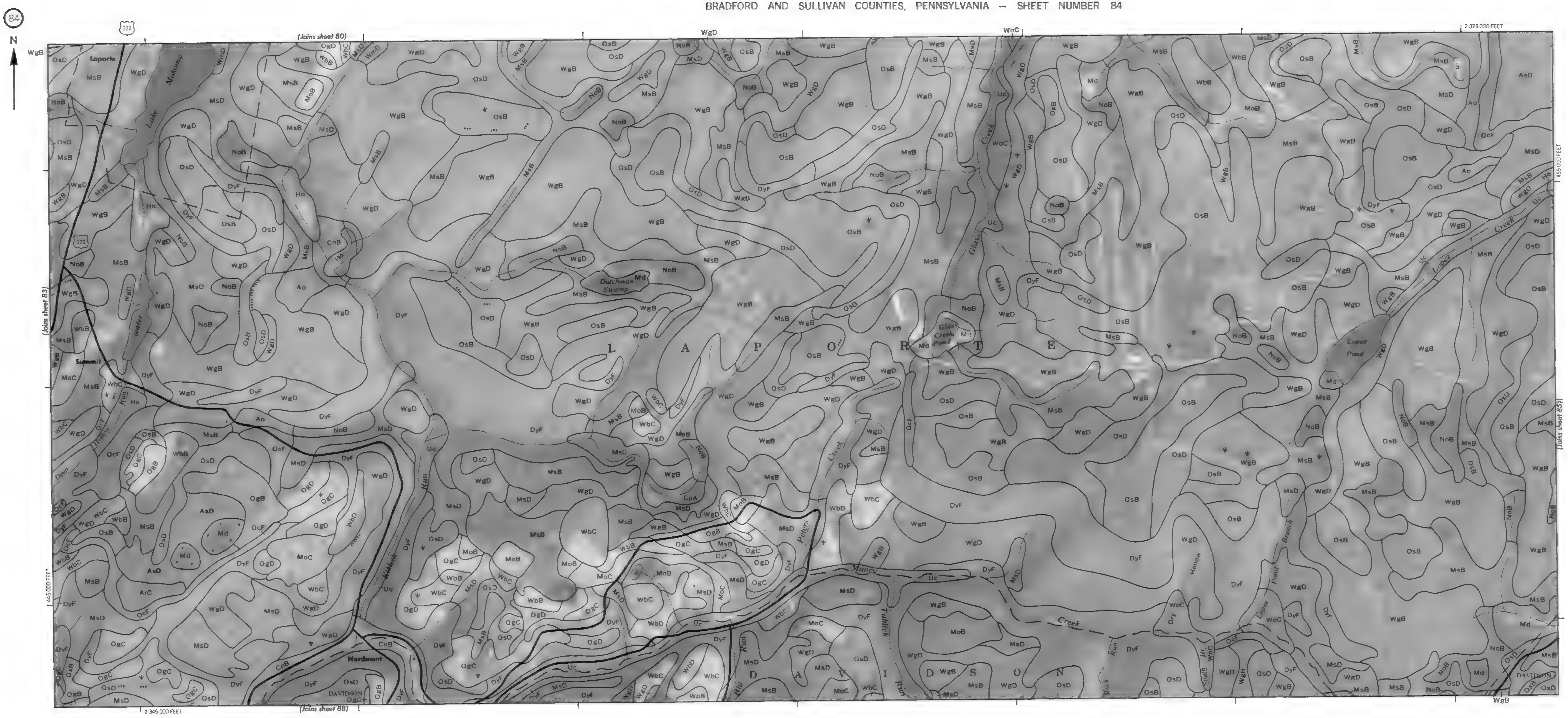

82
N
(Joins inset, sheet 64)
(Joins sheet 78)
(Joins sheet 83)
(Joins sheet 86)
2 305 000 FEET
2 275 000 FEET
458 000 FEET
445 000 FEET
HILLSGROVE
SHREWSBURY
LOYALSOCK CREEK
LYCOMING COUNTY
Ogdonia
Ogdonia Creek
Stony Run
Kettle Creek
Pine Run
Falls Run
Angel Falls
Rock Run
Hunters Lake
1 MILE
1 KILOMETER
SCALE 1:20 000



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

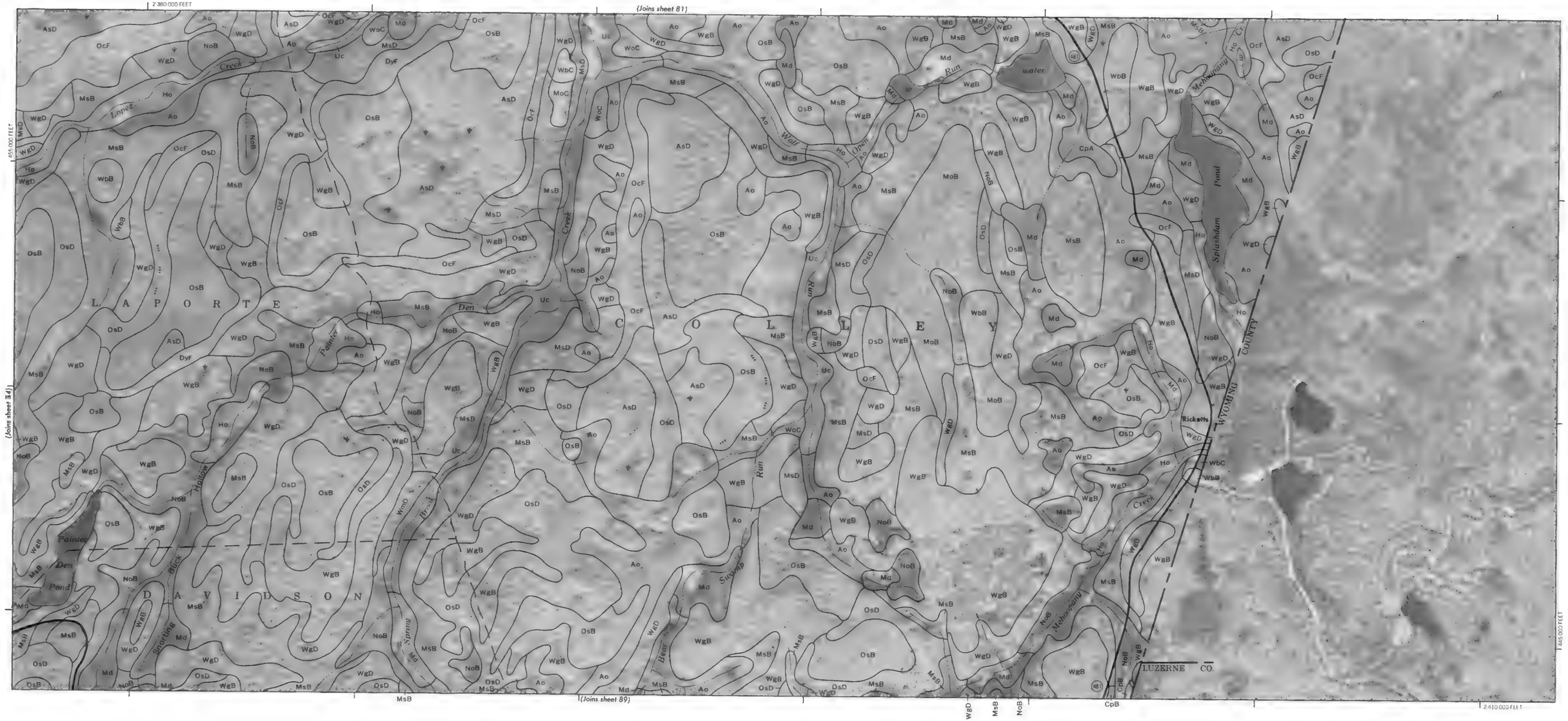


1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

BRADFORD AND SULLIVAN COUNTIES, PENNSYLVANIA — SHEET NUMBER 85

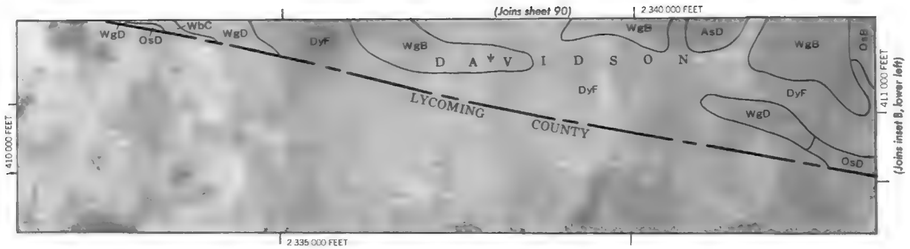


85
N

86

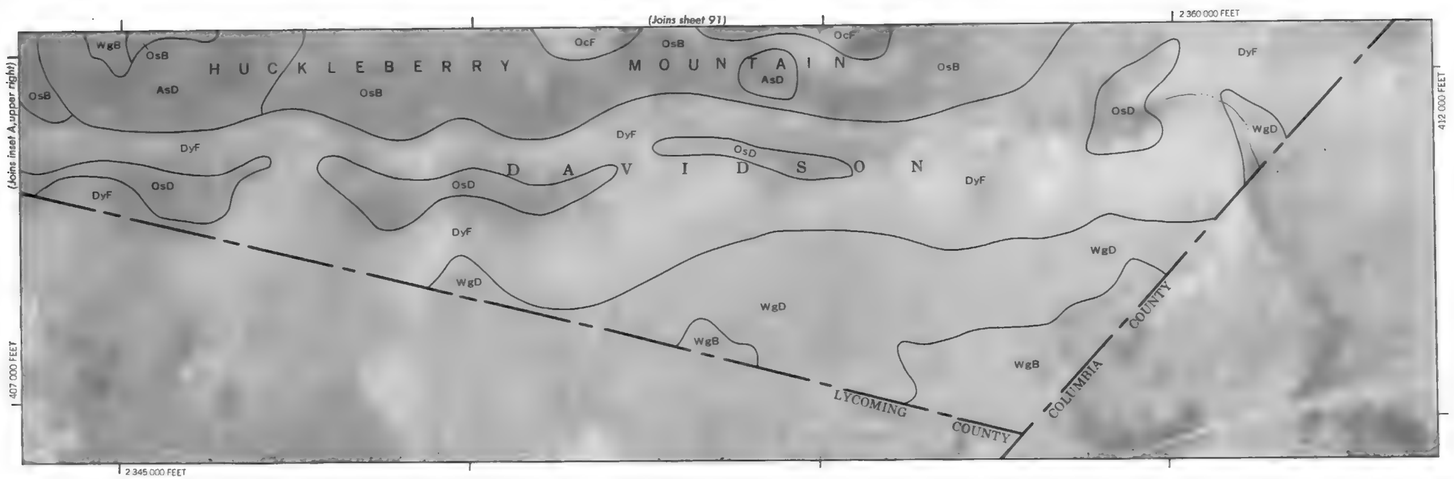
N

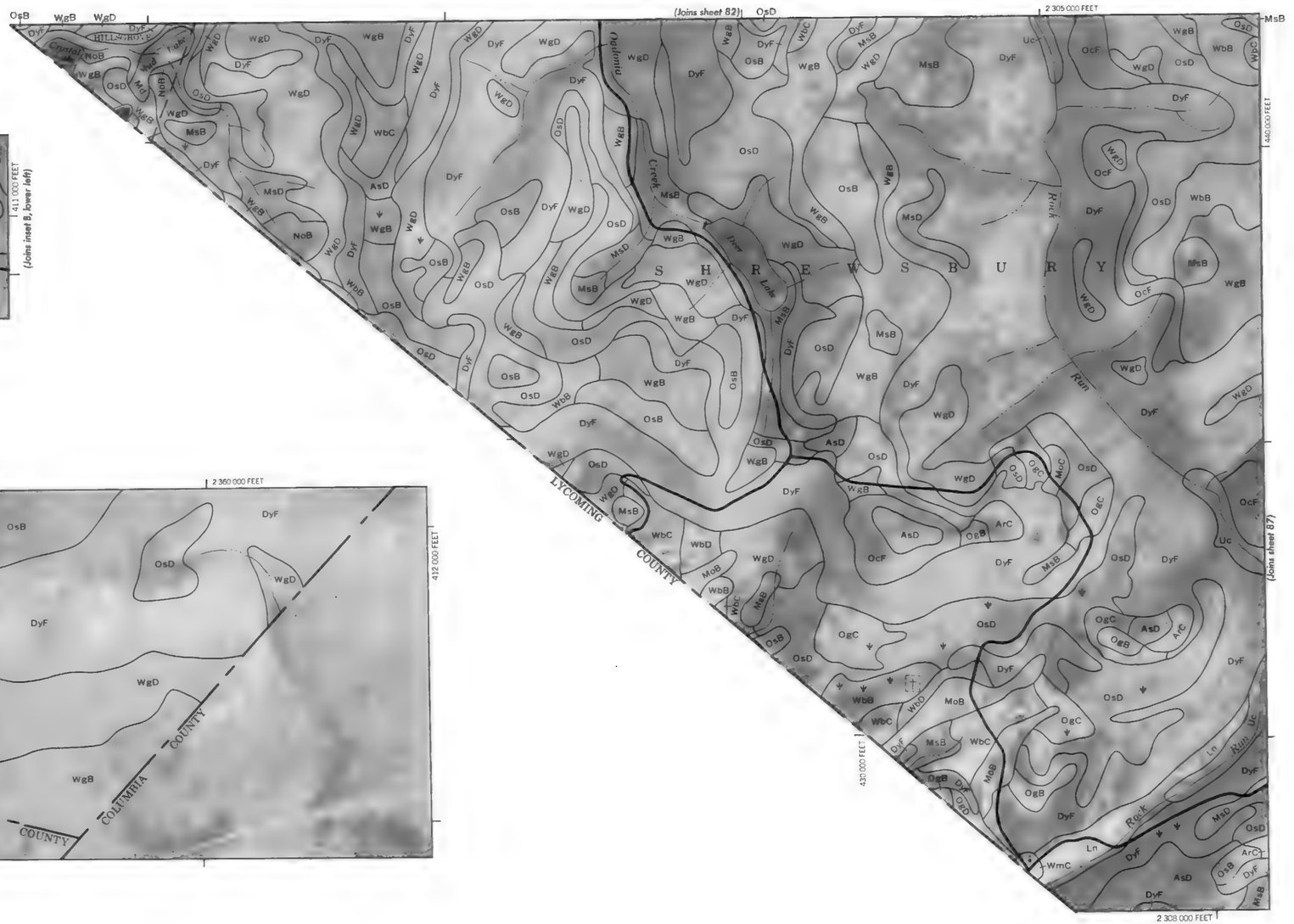
INSET A



1000 AND 5000-FOOT GRID TICKS

INSET B





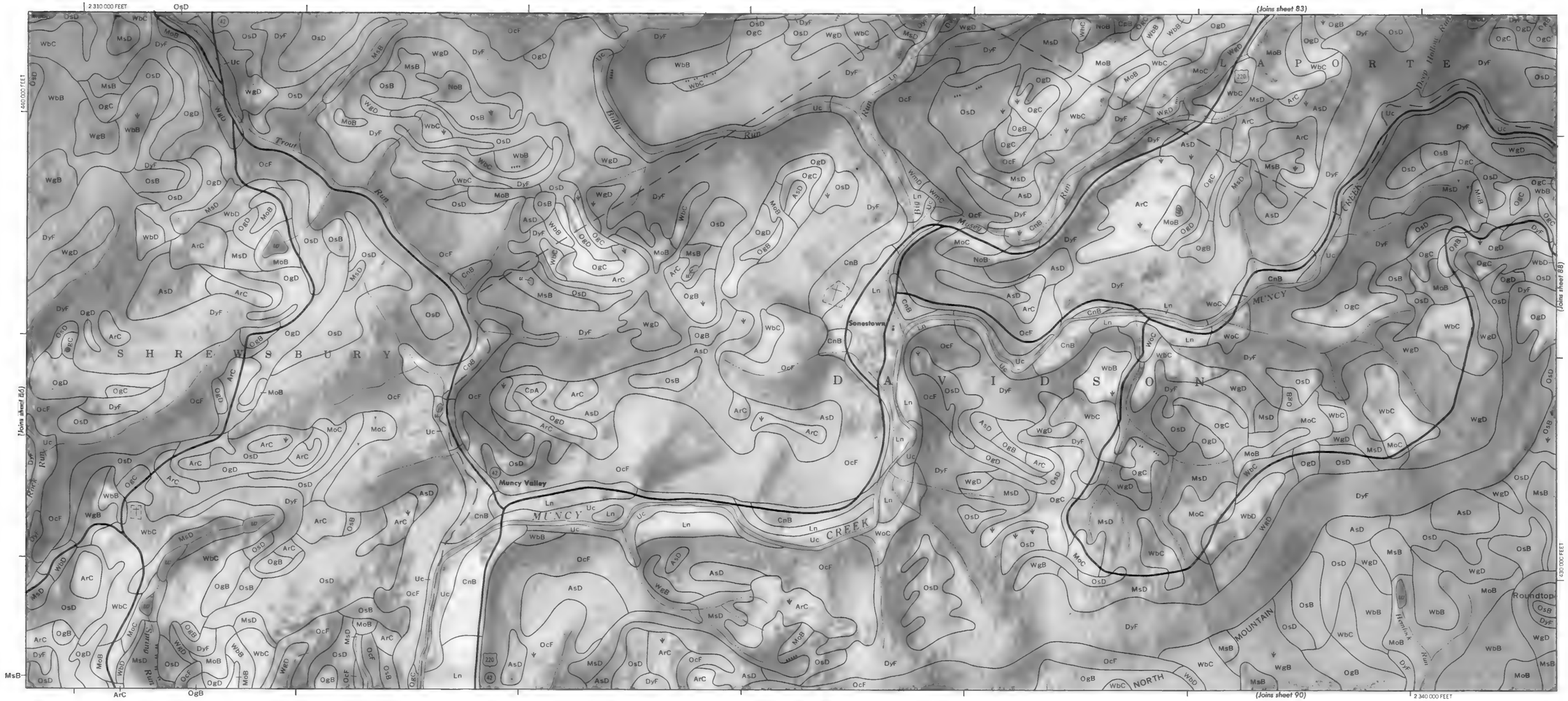
3000 AND 5000-FOOT GRID TICKS

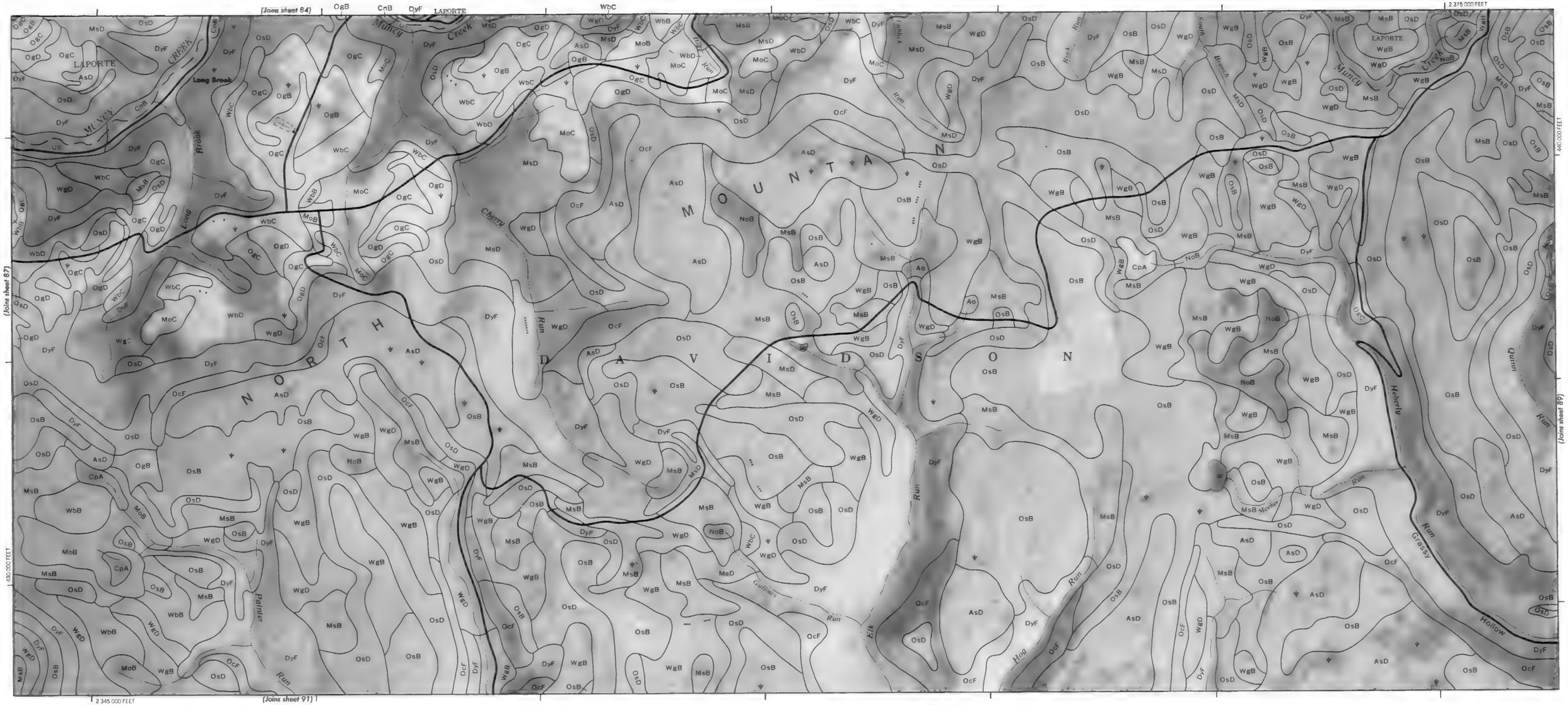
1 MILE 3/4 1/2 1/4 0

1 0.5 0 1 KILOMETER

SCALE 1:20 000

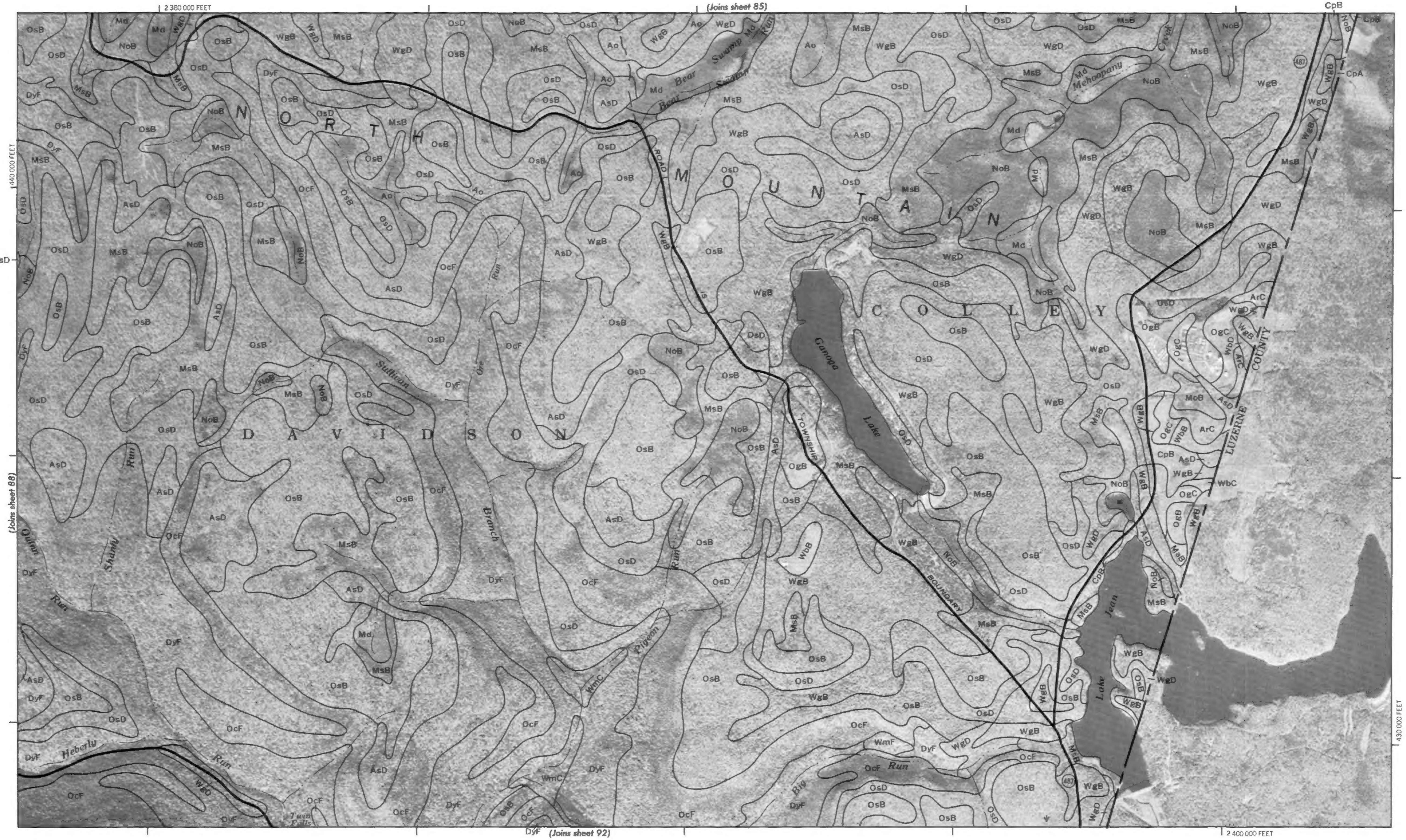
BRADFORD AND SULLIVAN COUNTIES, PENNSYLVANIA — SHEET NUMBER 87

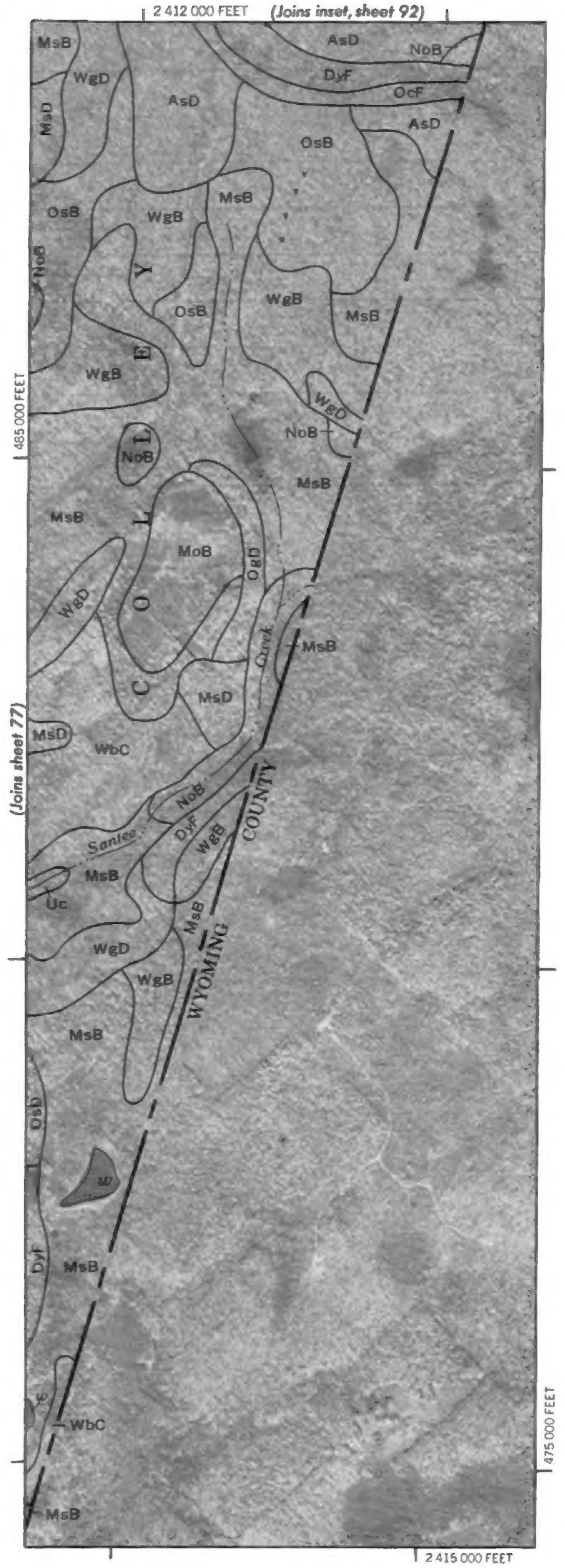




1 MILE
1 KILOMETER
SCALE 1:20 000

N



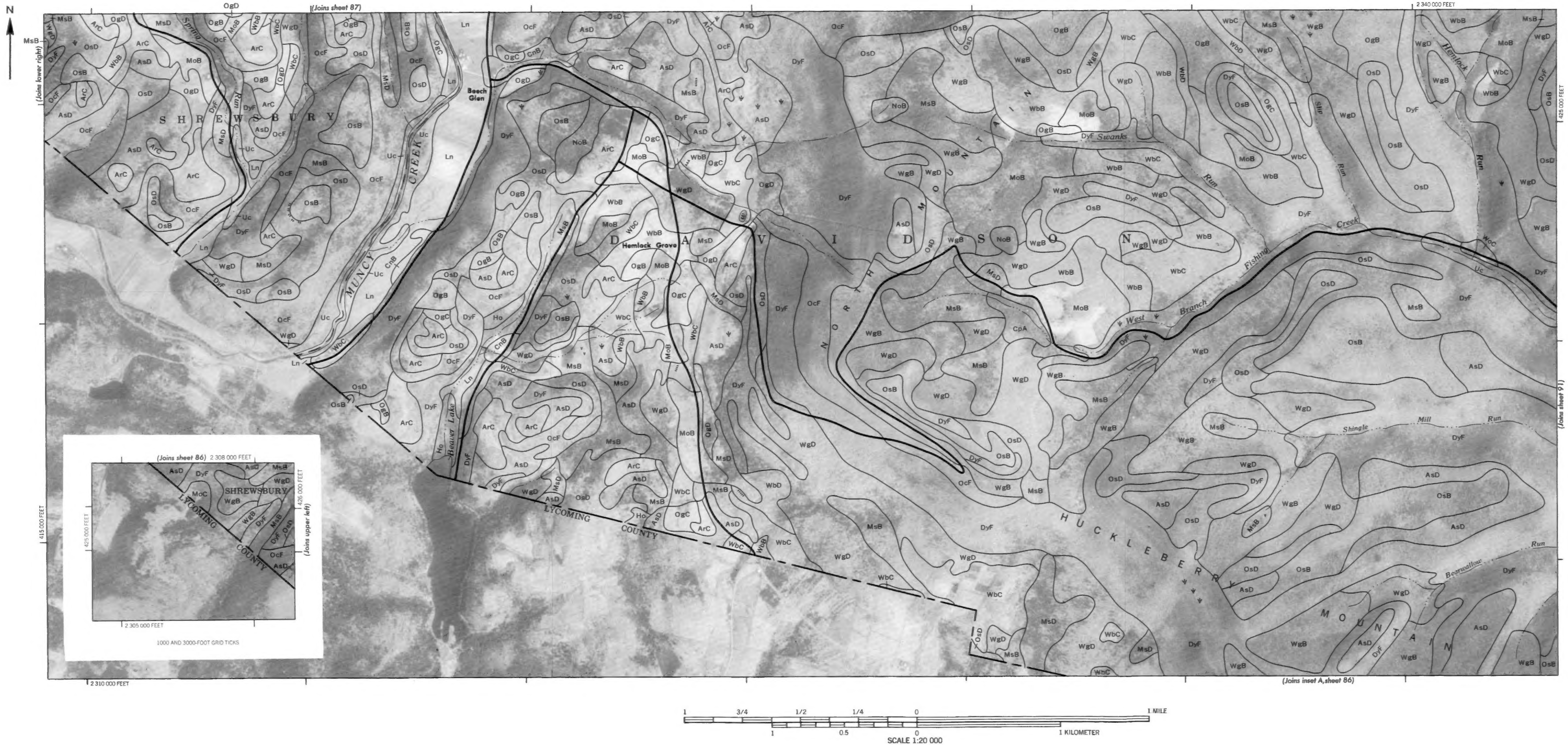


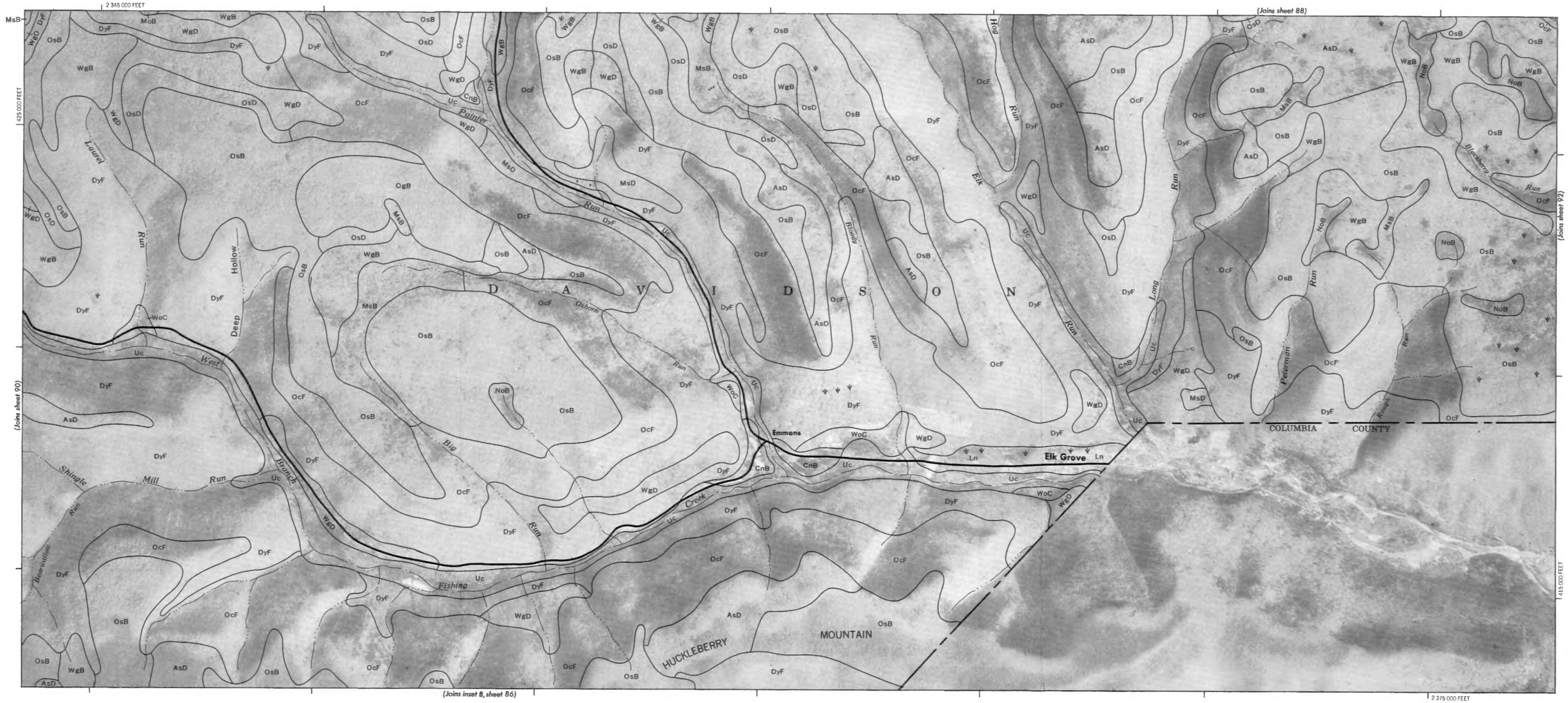
3000 AND 5000-FOOT GRID TICKS

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000


90
N
(Joins sheet 87)
(Joins lower right)
(Joins sheet 91)
(Joins inset A, sheet 86)
2 310 000 FEET
2 340 000 FEET
425 000 FEET
415 000 FEET
SHREWSBURY
DAVIDSON
NORTH MOUNTAIN
HUCKLEBERRY MOUNTAIN
MUNCY CREEK
Spring Run
Beech Glen
Hemlock Grove
Beaver Lake
Swanks Run
Slip Run
Hemlock Run
West Branch Fishing Creek
Shingle Mill Run
Bearwallow Run
LYCOMING COUNTY
(Joins sheet 86)
2 308 000 FEET
426 000 FEET
425 000 FEET
(Joins upper left)
2 305 000 FEET
1000 AND 3000-FOOT GRID TICKS
1 MILE
1 KILOMETER
SCALE 1:20 000



1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000

1 3/4 1/2 1/4 0 1 MILE

1 0.5 0 1 KILOMETER

SCALE 1:20 000